A CONTENT ANALYSIS OF READING SOFTWARE COMMERCIALLY AVAILABLE FOR Pre-K TO 3rd GRADE CHILDREN

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The purpose of this qualitative study was to investigate the content and characteristics of the currently available commercial reading software for Pre-K through third grade children. The design of the study was a content analysis.

Based on the evaluation rubric established by the researcher, ten commercial reading software were selected to be analyzed. By reviewing and transcribing, the data were obtained, and then coded, categorized, and interpreted. The findings from the analysis revealed that all reading software programs offered exercised for practicing basic phonics skills; the alphabetic principle, letter-sound association, word knowledge, sentence building, and reading comprehension. Depending on the software developers, phonics-based practice was presented in two ways; separate skill-based practice emphasis and storybook-reading emphasis. All software programs utilized drill-and-practice, direct instruction and mastery learning methods and utilized gaming strategies to motivate and engage the learners. Multimedia technology was used to make the software more appealing. All reading software programs were developed on the perspectives that view learning to read as the continuum of a child's oral language development and background experience about words. It is recommended that parents and teachers review and select the software based on reliable information sources, use the software as supplementary practice based on the learning objectives identified and individual student needs.

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CHAPTER 1

INTRODUCTION

Background of the Study

The animated world of computers is playing a growing role in reading lessons as teachers seek innovative ways to launch children on the voyage of literacy. Using reading software is part of an emerging wave in elementary school instruction**.** Advocates say that fanciful software programs engage the students in learning by weaving the alphabet and other lessons into playful images, but little evidence exists about the effectiveness of the costly technology designed for early readers.

Reading is an essential skill that draws a huge interest from parents as well as the educational community. From preschool and kindergarten through third grade levels, learning how to read and write are the most fundamental literacy skills elementary children are to develop. As personalized computer software becomes more commercially available for school and home use, using computer software to assist literacy development may develop as the prevailing instructional method. Commercial reading software programs could fascinate children and serve as a valuable and motivating learning tool. With a good piece of software, computers can help children if all conditions needed to enhance learning are provided. Research has shown that student use of computer software designed to enhance reading development can result in reading success at all ages and ability levels (Darter & Phelps, 1990).

Despite the fascinating computer software development technology, highly motivating reading software does not guarantee that children will acquire and improve

reading abilities. In the booming of educational software at present, publishing companies are promoting the superiority of their reading software designed for children by providing reading theories, such as phonics and whole language, and research support behind the software as well as how entertaining the software is to gain more marketing benefit. Despite the fact that advanced programming can create wonderful software, Haugland and Wright (1997) state that, "much of the software currently on the market falls short of glowing statements made by the manufacturers. Worse yet, most of the software is inappropriate for young children" (p.21). In considering software quality and appeal, current advanced technology of computer programming definitely makes the best designs of graphics, simulation, games, and data processing in a single CD-ROM. Nevertheless, in terms of educational value, content and instructional methods employed are the paramount components impacting the quality and effectiveness of reading software. The content validity of reading software program is determined by the matter of what is taught or presented in the software (Lewis, 1999).

Research studies indicate clearly that computer-based instruction (CBI) is effective for a wide variety of reading skill and concept areas, but the level of popularity of CBI in reading may vary (Reinking, 1988). The most common concerns of educators have to do with the effectiveness of computer-based instruction and with the appropriateness of the many possible roles computers can play in reading instruction. Recently, attention among educators has turned to address issues related to computer applications, or software, in support of the curriculum (Simic, 1993). The attention is directed toward how to best utilize quality software to support and enhance learning to read and write. The emphasis is not on using computer applications to increase reading

and writing achievement, but rather on whether the computer is used for meaningful reading and writing instruction. Therefore, to accomplish this goal, good software design is essential (Cassey, 1997). The content and instructional approach must be the focus rather than entertainment and fantastic feature emphasis.

In the early days of education computing and personal computers, few educational programs or software were available. Today, educational software development has changed dramatically. Many commercial software products for both computers used in school and personal computers used at home are published to assist reading and language arts learning and instruction. Willis, Stephens, and Matthew (1996) posit that when considering using the computer software for children to enhance reading development, availability is not the issue; appropriateness is. They suggest that software must be appropriate in several different ways: subject matter, efficiency, approach, appeal, ease of use, adaptability, help and feedback, compatibility, and cost efficiency. In many cases, few software will meet five or six appropriate categories, none will be exactly what the individual wants. Shade and Watson (1990, cited by NAEYC, 1996) state that computers could be beneficial to children when used in appropriate ways but can be misused, just as any tool.

As commercial reading software publishers credit educators who participate in designing and creating software, it is evident that reading professionals involve in the reading software development. Therefore, one could assume that software-publishing companies are making available educationally sound reading software that presents pedagogically appropriate content to the target children, such as Pre-K to third graders, and utilizes appropriate instructional methodology and appealing features.

Based on the computer capabilities and research findings, using software to help children learn to read presents phenomenal possibilities. Comprehensive reviews of literature reported various studies that indicate positive results related to gender, age, and thinking skills, as well as to content areas and the four major areas of development: social, emotional, cognitive, and physical (Clements, 1987). The success of using software for children is based on selecting appropriate software.

Despite controversy about computer software usage with young children, computers are a fact of life. NAEYC (1996) acknowledged the wide spread use of computers with young children and the trend indicating that the largest software growth recently has been in new titles and companies targeting the childhood education market. Also, a study by Escobedo and Evans (1997) stated that among the people who own personal computers and have young children, seventy percent have purchased software for their children. However, those parents often do not ensure that computer software is appropriate and can help children learn. This may be due to the lack of knowledge of what the software actually offers. While there are various ratings and software reviews, reliable information related to research is still slow in reaching consumers.

According to the computer capabilities, Alessi and Trollip (1991) state that reading software can provide a context where students are given opportunities to work and learn in all the various computer modes: tool, tutor, and tutee As tool, the computer is used to aid learning and to facilitate academic work, such as with the word processor. As tutor, the computer delivers instruction, as is the case with most CBI. As tutee, the student teaches the computer and in doing so must learn as well. The current computer programming technology can combine these three modes to facilitate learning in a single

reading software CD-ROM. According to Alessi and Trollip (1991), using computer-based instruction in reading is likely to be beneficial in the situation where extensive individual student practice is needed and student motivation is lacking.

In using computer software in early reading instruction related to content and approach, Simic (1993) posits that reading software should focus on meaning and stress reading comprehension. Learners should have opportunities to work with whole, meaningful texts. Programs that offer learners a chance to process large chunks of related text, rather than bits and pieces of unrelated language fragments, allow students to use and extend what they know about reading comprehension. Learners should have opportunities to work with word-recognition programs that stress the use of word meanings in conjunction with phonics and structural analysis that are offered within a contextual framework that helps the learner make sense of the text. Children should have the opportunities to apply the skills being taught in meaningful ways. Programs that deny the learner an opportunity to make use of what is being "taught" are merely assessment tools and do little to further the learner's growth. Also, children should have the opportunity to work with computer materials that use content and language that are within the range of their conceptual development.

Furthermore, Simic (1993) purports that CBI in reading should foster active involvement and stimulate thinking. The reading program software should provide the purpose of the learning tasks. Learners should be aware not only of what they are supposed to do but also of the importance of doing it. Programs that build in opportunities for students to make choices and test predictions help them learn to think and act on their own rather than merely react to someone else's thinking. Reading should

support and extend students' knowledge of a wide variety of text structures upon which to apply and refine their comprehension skills. A variety of narrative and expository structures should be provided. CBI in reading should make use of content from a wide range of subject areas. Learners should have opportunities to use the computer as a means of applying reading strategies to all areas of the curriculum. Programs related to science, social studies, and math require the use of strategies for reading comprehension. Importantly, CBI in reading should link reading and writing. Learners should have opportunities to create text with the computer for sharing and use by others. This frequently involves making explicit use of what they know about what makes a text comprehensible. Revision and proofreading strategies clearly involve the combined application of reading and writing skills. All of these elements can be programmed in single reading software if it is well designed.

In the past, much of the available software employed predominately a skills-based approach of reading instruction. The drill and practice-type exercises of a particular skill presented in the software were often equated to “electronic workbooks,” (Doyle, 1988, p. 239) and displayed in a game-like fashion. Those skill and drill exercises were acceptable according to past beliefs about how children learned how to read. However, based on what is now known about reading instruction, strictly skill/drill software no longer suits educational needs. A prominent current view of reading employs some different elements than the reading programs of the past. Although the importance of mastering skills is recognized, other factors need to be present as well. The new view emphasizes utilizing authentic, complete texts through which meaning can be constructed and skills can be developed simultaneously. This view contrasts seeing reading as merely a series of skills

that are sequentially learned. The current view of reading employed by a large majority of educators is the interactive model of reading (Stanovich, 1980).

The interactive model of reading falls somewhere between the top-down and bottom-up models of reading (Vacca, Vacca, & Gove, 1995). All of these models view reading as a form of communication in which the goal is to construct meaning from the text. What differs in each model is what information is used and how readers use that information to create meaning from texts. The bottom up model stresses the belief that meaning is constructed by first analyzing the print, or graphophonic information. Students must know how to decode the symbols of the written text into sound and words before they can create meaning from it. This is done through teaching letter/sound and word identification skills in a sequential manner. Reading content or texts read are packages with a preplanned scope and sequence skills controlled that require knowledge of only those skills that have been taught in order to read them. This model of reading is incorporated into the phonics and skills instruction of old basal reading programs (O'Brien, 1995) and commercially published programs, such as SRA, and is how reading was taught for many years.

The top-down model of reading is based on the belief that meaning from text begins with accessing the students' background knowledge. Students use contextual and syntactic cues to make predictions about what the text says (Vacca, Vacca, & Gove, 1995). The top-down model focuses around the elements that whole language lie. Comprehension occurs when meaning is constructed from the whole text, rather than building meaning from individual letters or words as in the bottom-up model. Mastery of a series of particular skills is not considered a prerequisite for reading. Students learning

under this model are encouraged to choose their own material to read. Teachers provide meaningful activities with ample opportunities for students to read, write, speak, and listen.

In the interactive model of reading, the process of making meaning involves the elements of both models; students are encouraged to use information from the print and their background knowledge concurrently as they read. The need to develop children's letter and word identification skills as a strategy for decoding is recognized as well as the value of contextual and syntactic cues as another aid. Texts used for instruction can take a variety of forms, especially authentic texts that provide children with real reading situations. Development of skills and word identification occur as it is applied to authentic reading situations. Skills are no longer taught and practiced in isolation as was believed effective in the skill-based instruction in the past decades. Reading is also viewed as a social act in which children can learn a great deal from each other, more mature children, and adults (Vygotsky, 1978). A variety of social interactions can be created by means of computer simulation programming (Alessi & Trollip, 1991).

As computer software is used for developing reading abilities, it would be unwise to use and to have children complete activities on the reading software that are not congruent, both in content and in approach, with reading pedagogy. In addition to today's view of reading, developing a love of reading is also a fundamental component of becoming a successful reader. It is in Pre-K through third grades where children are forming literacy skills and laying the groundwork that subsequent learning will be built upon. The importance of fostering the love of reading and a strong ability foundation in beginning readers cannot be denied. Using computer software has been proven to supply

motivational force that can encourage a positive attitude in young readers (Goldman, 1989; Rude, 1986). However, it is recognized that since learning to read is a complex process, there is not *one* simple solution that will make all children accomplished readers.

Unfortunately, in commercial software marketing, software descriptions often include what publishing companies deem unique reading software features alongside enthusiastic quotes by satisfied users. As a result, commercial software may appear to provide beneficial reading assistance without any real documentation.

By viewing and analyzing selected reading-related software for Pre-K through third grade children, this content analysis study is intended to provide information in three areas: (a) descriptions of current reading-related software, (b) specific benefits of using current reading-related software, and (c) recommendations for teachers and parents who want to use reading-related software with children.

According to appropriateness of reading software posited by Willis, Stephens, and Matthew (1996), the subject matter and instructional approach employed in the reading software are the most important aspects. Approach is the instructional method that facilitates learning of the content. Instructional approaches, such as direct instruction, tutorial, and drill and practice, should also be effective and appropriate to the learners. Subject matter is the content that a program intends to have students learn. Subject matter should be related to school curriculum appropriate to the students' grade levels. The other topics concerned with motivation and technological efficiency, such as appeal, ease of use, adaptability, and compatibility, are also eassential.

Lewis (1999) asserts clearly that computer software must be valid as a school subject or content which children will be taught. In addition, educational courseware

should employ the process, which focuses upon intellectual skills, that is capable of helping children to acquire literacy. Advanced technologies, such as large storage capacity CD-ROM, visual-oriented programming, and the increasing intelligence capacities of computers, together with meaningful research evidence and findings in reading, have resulted in extended opportunities for creating quality and appealing reading-related software for children at present day.

Statement of the Problem

This study analyzed the content and instructional approach presented in reading software commercially available to supplement learning to read for early elementary children, Pre-K through third grade.

Purpose of the Study

From the researcher's perspective, this study attempted to fully provide the content description of a limited but representative sample of commercially available reading software in the market targeting Pre-K through third grade children. The analysis information would assist parents, teachers, and educators in the pursuit and selection of quality software to support children's learning to read.

When determining the effectiveness of commercial software to enhance learning to read for young children, parents and teachers are often faced with uncertainty. This study would provide recommendations and suggestions for using reading software to enhance individual learning, such as using software with personal computer at home.

Research Questions

The following research questions are addressed in this study:

1. What is the content of commercial reading software designed for Pre-K through third grade children?

2. What are the instructional methods employed in the reading software commercially available for Pre-K through third grade children?

3. What are the reading models employed in the reading software?

4. What are the programming methodologies (e.g., tutorials, games, drill and practice, simulations, and tests) used in the reading software?

5. What are the other features utilized in the reading software to make the instruction more appealing (e.g., graphics, animation, speech recognition, multimedia, and hypertext) for young children?

Significance of the Study

Computer software is popular with both teachers and students. Mehlinger (1996) purports that computer-based instruction will be extensively used more frequently in day-to-day living, and students are excited about it. Also, parents and teachers feel their children can learn more through its use. Despite these facts, Haugland & Wright (1997) state that commercial software is developed toward educational entertainment, termed as "edutainment," which is criticized as not really educational, but instead a computerized game.

Although effective CBI reading software are often specially prepared by researchers, not available for public use, commercial software may potentially be a good supplement when carefully selected (Case, 1996). A critical issue is that one has to know what substantial features the software offers and how each helps learning.

The short description that appears on the package of a commercial reading software program often does not provide sufficient information of the content. Rather, the description of the software is used as advertising for marketing purposes. A full description of content the commercial reading software offers is rarely provided. Without full information provided, consumers seem to be lured into the software market pool.

This study involves an integrative content analysis of commercial reading software designed for Pre-K through third grade children, resulting in full content information that may be useful for parents, teachers, and educators. When parents and teachers understand the content of the software, commercially available reading software could be used more effectively to benefit children.

Limitations

For this study, the content analysis technique was used. The researcher had to construct the categories for analysis and interpretation. As a result, the findings relied on the researcher's exploration and conclusions about the commercial reading software.

The content in the commercial reading software was categorized in terms of purpose of reading for early elementary children, Pre-K through third grade. However, significant technological features, such as graphics, animation, and computer capabilities, which are related to learning to read, were also included. The reading software being analyzed was limited to Windows PC and/or System Mac platform.

Also, the results of this study were limited to and applicable only for the commercial reading software available when this study was conducted.

Definition of Terms

Reading software, in this study, is defined as personalized computer software in CD-ROM format, which is described or stated somewhere on the package as “reading” software that is designed for assisting learning to read.

CHAPTER 2

RELATED LITERATURE

First, to provide a general idea of how educational software is developed, instructional methodology behind the development of computer-assisted instruction (CAI) or computer-based instruction (CBI) is reviewed. Second, the historical development of computer-based reading software designed for young children is provided to reveal more specific knowledge of how computers have been used in reading education. Third, theories contributing to early reading content and instruction are reviewed in order to guide the analysis in this investigation. Therefore, the review of literature will be focused on relevant areas: (1) computer-based instructional methodology, (2) development of computer software for early reading, (3) theories and practice of early reading instruction, and (4) important features of CBI designed for young children.

Computerized Instructional Methodologies

Instructional computer programs, also known as *courseware*, are referred to by a variety of names. Some of these are computer-assisted instruction (CAI), computer-assisted learning (CAL), and computer-based instruction (CBI). Effective instructional computer programs basically follow four phases: (a) presenting information, (b) guiding the student, (c) practicing by the student, and (d) assessing the student learning (Alessi & Trollip, 1991). There are several instructional methodologies, or strategies, used in conjunction with the use of computer education. These methodologies are employed in programming of software designed for reading. They are drill and practice, tutorial,

simulation, games, and tests (Alessi & Trollip, 1991; Hefzallah, 1999). Usually, in one courseware more than one instructional method is employed.

Drill and practice programs are designs that integrate previously learned material through practice on the computer. In drill and practice software, immediate feedback, individualization, and self-pacing are provided. They are usually a supplement to other instruction and are the most common type of CAI found (Budoff, T. Thorman, & A. Gras, 1985). According to Hefzallah (1999), four basic principles of programmed instruction are usually employed in drill and practice programs: (a) The learning material is presented in small successive steps with explicit practice and testing of each step, (b) presentation of subsequent steps depends on the learner's response, (c) immediate feedback is provided or guided to lead the learner to correct the errors, and (d) the learner proceeds at his own rate.

Drill and practice programs aim at drilling the learner in basic subject matter or skills. Usually drill and practice exercises have different levels of complexity to suit the needs of different learners and to provide the opportunity for the learner to gradually advance to higher levels at his own pace. Some drill and practice programs incorporate game strategies. Mastery of the target skills is a prerequisite to the winning of the game. Thus, as the learner plays, he reinforces the skills he acquired. With the current advancement in computer technology, drill and practice software makes use of the multimedia capabilities using colorful graphics, animation, and audio clips, in playing a game that requires the mastery of subject-matter skills and makes learning more fun and exciting.

Tutorials are programs that generally engage in the presenting of information and guiding the learner in initial acquisition. Similar to drill and practice, tutorials guide the learner through small steps until the learner understands the information the program is designed to teach. Drills and games typically engage in the practicing phase. Sophisticated programs employ a branching strategy to guide the learner, if the learner repeats a mistake, to remedial exercises or demonstrations and then back to the point where the learner left off (Hefzallah, 1999). Also, tests are almost always presented to assess the level of learning (Alessi & Trollip, 1991).

Alessi and Trollip (1991) suggest that simulations are more complicated and may be used to present information and guide the learner, to guide and drill, or to test the student's knowledge. However, it is rare for a single lesson of any methodology to provide all four phases of instruction (presenting information, guiding learner, practicing, and assessing student learning). Hefzallah (1999) asserts that simulation programs present the student with a virtual situation and allow the student to make a decision and safely experience the outcome of the decision. Simulations allow the learner to experiment with and experience situations, which might otherwise be dangerous or impractical to manipulate directly. In reading software programs, simulations are rarely employed.

Games are fun. They are a powerful instructional tool becoming more prevalent with the proliferation of computers. They can be very similar to simulations. The purpose of both simulations and games is to provide an environment that facilitates learning or the acquisition of skills. Simulations attempt to do so by mimicking reality. Conversely, games may or may not simulate reality, but they are nearly always characterized by

providing the learner with entertaining challenges (Alessi & Trollip, 1991). Young children like to play and are excited about using computer games; therefore, most educational software designed for young children employs instructional games. However, poorly designed computer games, such as games that allow guessing and chance or random factors to contribute to winning, do not really develop a student's skills (Jonassen, 1996). Jonassen states, "winning in academic games should depend on solely the application of subject-matter knowledge and/or problem-solving skills" (p. 524). Success in learning games should require players to direct and manage their intellectual skills or thinking in an efficient and effective manner (Gagne, 1985). "Thus, one of the advantages of computer games is that they have the potential to challenge students' thinking in a variety of ways" (Jonassen, 1996, p. 525).

Computerized tests generally are designed to assess what students learned, which is the final phase of instruction. According to Alessi & Trollip, (1991), computerized tests are used for a variety of purposes: determining what a student knows and does not know; rank ordering students in terms of performance; assessing grades; screening for school admission; and diagnosing learning problems. In this investigation, preliminary preview of commercial software for young children found no computerized tests.

In short, to motivate and engage children in learning, games are becoming more popular in commercial software publication. An effective instructional game maintains the learner's interest and encourages the acquisition and development of the desired knowledge or skills. Because games tend to motivate students and focus their attention on the goal of the game, they can be successfully used to convey a variety of information, such as fact, principles, and skills (e.g., problem solving, decision making,

communication, and formulation of strategies) (Maidment & Bronstein, 1973; Nesbitt, 1971). However, it was found that drill and practice software was substantially the largest category of software commercially available in 1995 (Balajthy, 1996).

Development of Computer-based Reading Software

Computer-based instruction in reading was first formally used at the elementary school level attempting to create a computer-based reading curriculum under the direction of the Stanford project in 1963 (Marsh, 1983). At that time it was thought that computers could replace teachers. Initially, pioneer mainframe computer technology could only provide individual access to the software programmed for the central mainframe. Therefore, the use of the software was limited to certain projects that only small groups of students could access. Consequently, reading software did not become widely used in schools until the mid-1970s when microcomputers became available. In its earliest stage, computers were used for instruction in the language arts, especially in reading and writing (Reinking & Bridwell-Bowles, 1991). "Computers have been used to teach and to drill specific reading and writing skills, to keep records in order to manage students' progress, to motivate reluctant readers and writers, and to engage students in a variety of other computer-based activities that have been used to address the goals of language arts instruction" (p. 311).

The microcomputer allows more individualized instruction by providing the freedom of choice in selecting reading software used by each student. In the past, computer-based reading instruction has involved software that teaches and drills specific skills, such as phonics skills like consonant and vowel sounds. Students were introduced to the new skill, provided with an example of that skill, and then the students practice the

skill, often through a game format. From the 1970s to the 1980s, computer technology was capable of producing electronic workbooks (Doyle, 1988) that presented activities similar to basal reading programs. Workbooks were simply transferred to floppy disks so that students could complete them on the computer. These electronic workbook programs provided drill and practice that produced results equal to those of worksheets (Marson, 1985).

Beginning in the mid-1980s, computers were considered to be an important factor in reading and writing instruction, but were not being used extensively. Computers in language arts instruction have been "influenced by the availability and characteristics of commercial software for reading instruction" (Reinking & Bridwell-Bowles, 1991, p. 312). However, few commercial software required students to read and comprehend connected text; some focused on individual letters, words, or sentences (Rubin, 1983). The majority of language arts software packages were in the area of vocabulary, spelling, and grammar (Day & Day, 1984). In addition, typical reading software employed drill-and-practice format, often with game-like elements. Most of the commercial reading software focused on reading skills that did not require reading connected texts (Reinking, Kling, & Harper, 1985). It has been criticized that commercial software for language arts focused on low-level, isolated skills, and tended to evaluate rather than guide students' response (Smith, 1984; Duin, 1987). However, publishers of commercial software are now developing more diverse programs for language arts instruction. They are becoming responsive to the concerns expressed by educators (Reinking, 1989).

Evolution and advancement of technology over the years to the 1990s have increased the capability of computers and programming, resulting in an increased use of

computers in schools and home settings. The more advanced technology offers intelligence and capabilities with the development of the compact disk-read-only memory (CD-ROM) that stores more memory. This allows interaction and improves graphics, sound, animation, and data processing for students experiencing electronic books or interactive books.

Electronic book CD-ROMs are software programs that maintain text and pictures, like a children's storybook in its original form. However, electronic books provide options for experiencing the story. For example, students can have the computer read the story for them and get help from the computer while reading on their own when necessary (e.g., identifying words and clarifying concepts). In the electronic books, the size and font of the text can also be modified to accommodate individual learners (Miller, Blackstock, & Miller, 1994), which traditional storybooks cannot offer when individually used by a child (McKenna & Watkins, 1995).

Electronic books are commercial software that support literacy learning. They have been shown to make reading more enjoyable and less frustrating, aid in developing decoding skills and therefore improving fluency, and provide effective individual support (McKenna, Reinking, Labbo, & Watkins, 1996). This computer-mediated text allows for vocabulary development, as definitions of unknown words are provided. Furthermore, reading ability can improve through increased sight word recognition, a result of being able to access pronunciation of words programmed in the software (Miller, Blackstock, & Miller, 1994).

From the study of trends in the publication of commercial software for reading or literacy education in 1995 by Balajthy (1996), publication of CD-ROM electronic books

and application software, which is used to create specific projects such as printing, has increasingly and continuously grown from the early 1990s. For drill and practice, the market share declined, but there is still a significant amount of software that deals with word identification skills, almost always both sight word development, or word recognition, and phonics drills designed for preschool and primary graders. However, it was found that drill and practice software was substantially the largest category of software available besides electronic books. Balajthy also found that, for marketing, the presentation of content and other appealing features (e.g., graphics and animation) in commercial reading software were usually updated in the new versions of the software by publishers, but few changes of the content were made.

Theories and Practice in Early Reading

Definitions of Reading

The most widely cited and agreed-upon definitions of reading are firstly reading is the process of constructing meaning from written texts. Reading is a complex skill requiring the coordination of a number of interrelated sources of information (Anderson et al., 1985), such as the reader's existing knowledge, the information suggested by the text being read, and the context of the reading situation (Wixson, Peters, Weber, & Roeber, 1987 in NCTE, 1997).

A common aspect of these views is that reading is a process in which information from the text and the knowledge possessed by the reader act together to produce meaning (Anderson et al., 1985). Reading is also a constructive process in which readers draw on their prior knowledge about what they read. Thus, the meaning constructed from the same text can vary among readers because of differences in the knowledge they possess.

Some children may completely lack knowledge on a particular topic; others may know something, while still others may know a lot. Differences in knowledge influence children's understanding. Older mechanistic definitions of reading such as the translation of printed symbols into oral language equivalents are incomplete. There is widespread agreement that without the activation of relevant prior knowledge by a cognitively active reader and the melding of that prior knowledge with the text information, there can be no comprehension of text.

Even definitions of reading that emphasize meaning indicate that reading is activated by print. The reader must be able to translate the written words into meaningful language. Virtually all four- and five-year-old children can communicate with and learn from oral language, but very few can read, because they lack the ability to identify printed words. While simply being able to recognize or *say* the printed words of text without constructing the meaning of that text is not reading, constructing meaning from written text is impossible without being able to identify the words.

The terms word identification, word recognition, and decoding are frequently used interchangeably. The new Literacy Dictionary (Harris & Hodges, 1995 in NCTE, 1997) defines both word recognition and word identification as "the process of determining the pronunciation and some degree of meaning of an unknown word" (p. 282). For words that are in a reader's meaning vocabulary, unlocking the pronunciation leads to the word's meaning. If a printed word is not in a reader's meaning vocabulary, word-identification skills may allow access to the word's pronunciation but not its meaning. Being able to arrive at the pronunciation of a printed word constitutes word identification in the most minimal sense; however, if the reader is unable to attach

meaning to the word, then he or she has not read the word, since reading must end in meaning construction.

From the study of how young children learn to read in The Making of a Reader at Maple Nursery School, Cochran-Smith (1984) concluded that in a broad sense reading and writing in early literacy were much more than decoding and encoding. Early literacy involved knowing how to effectively organize and use print for one's own purposes, interpreting contextualized print in a wide variety of situations. Reading is related to oral and written language. Storybook reading plays a very crucial role in children's reading development and knowledge of the world. It is believed that knowledge of how to use print precedes and supports the important mechanical skills of encoding and decoding.

The Reading Excellence Act (NCTE, 1999, p. 2), Amended Title II of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 6601 et seq.) defines reading as follow:

> SEC. 2252. Definitions (4) READING, 'reading' means a complex system of deriving meaning from print that requires: (A) the skills and knowledge to understand how phonemes, or speech sounds, are connected to print; (B) the ability to decode unfamiliar words; (C) the ability to read fluently; (D) sufficient background information and vocabulary to foster reading comprehension; (E) the development of appropriate active strategies to construct meaning from print; and (F) the development and maintenance of a motivation to read.

From this review of reading definitions, initially, we can conclude that reading has to do with language and social interaction, knowledge about print and words - oral or written, background knowledge connected to words and text, and skills including motivation for constructing meaning, such as decoding skill and comprehension skills. These are substantial content that should be included in reading software for early elementary school children.

However, learning to read and reading instruction, including reading materials and software creation, definitely rely on psychological behavioral theories. Effectiveness of learning and instruction in early reading must correspond with behavioral theories of learning and prevailing theories of child development. Following are the learning theories that contribute to reading development in early age, or beginning reading.

Theories and Instructional Approaches Related to Early Reading

The topic of reading is of great social importance because it pertains to the issues of literacy and intelligence. Reading is probably one of the most researched topics in education and the primary focus of instruction at the elementary levels. Reading definitions alone cannot exhaustively determine what good early reading software should include. Importantly, learning theories related to reading play a crucial role in teaching reading supplemented by thousands of materials and software. There are many theories of reading and different reading programs (Chall, 1967; Pearson, 1984; Singer & Ruddell, 1976). From a learning perspective, reading is closely related to many other cognitive processes or domains including attention, concept formation, imagery, language, memory, and perception.

Gibson and Levin (1975) outline a theory of reading based upon principles of perceptual development that include distinctive features, invariant relations in events, higher order structures, abstraction, ignoring irrelevant information, peripheral mechanisms, and reduction of uncertainty. These principles are largely based upon the information pickup theory. Gibson and Levin emphasize that a theory of reading must account for the different types of reading (e.g., enjoyment versus learning) as well as significant differences between beginners and mature readers. From many different

analyses, Resnick and Weaver (1979) provide a general model that describes early stages of reading dependent upon letter-sound correspondence with increasing importance upon semantic-linguistic aspects over time.

The social development theory of Vygotsky (1978) has as a part of its compelling framework that social interaction plays a fundamental role in the development of cognition. The most essential aspect of Vygotsky's theory related to this study is the idea that the potential for cognitive development is limited to a certain learning span called the "zone of proximal development" (ZPD). Full development during the ZPD depends upon full social interaction. The range of skill that can be developed with adult guidance or peer collaboration exceeds what can be attained alone. This theory of cognitive development has two implementing principles: (a) Cognitive development is limited to a certain range at any given age, and (b) full cognitive development requires social interaction. According to these ideas, instructional methods employed in reading software should provide help or guidance and opportunities for users to interact or communicate with the computer or other users for reading purposes.

Also, the constructivist theoretical framework of Bruner (1983), focusing on language learning in young children, suggests that learning is an active process in which learners construct new ideas or concepts based upon their current and past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. Cognitive structure (e.g., schema and mental models) provides meaning and organization to experiences and allows the individual to go beyond the information given. Curriculum, or learning content, should be

organized in a spiral manner so that the student continually builds upon what they have already learned.

Bruner (1966) states that a theory of instruction should address four major aspects: predisposition towards learning; the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner; the most effective sequences in which to present material; and the nature and pacing of rewards and punishments. Good methods for structuring knowledge should result in simplifying, generating new propositions, and increasing the manipulation of information. Bruner's principles of learning are concerned with the experiences and contexts that make the student willing and able to learn (readiness), spiral organization of knowledge instruction, and facilitating extrapolation and/or fill in the gaps (going beyond the information given).

Piaget (1970) has profoundly affected our understanding of child development. The concept of cognitive structure is central to his theory. Cognitive structures change through the processes of adaptation, assimilation, and accommodation in different stages of development. Cognitive development consists of a constant effort to adapt to the environment in terms of assimilation and accommodation. In this sense, Piaget's theory is similar in nature to other constructivist perspectives of learning (e.g., Bruner, Vygotsky). While the stages of cognitive development identified by Piaget are associated with characteristic age spans, they vary for every individual. In learning, first, different explanations of reality will be provided to children at different stages of cognitive development. Second, cognitive development is facilitated by providing activities or situations that engage learners and require adaptation. Third, learning materials and activities should involve the appropriate level of motor or mental operations for a child of

a given age and avoid asking students to perform tasks that are beyond their current cognitive capabilities. Fourth, teaching methods have to actively involve students and present challenges (Piaget & Inhelder, 1969). All of the learning processes described by Piaget – interactivity, personal activity of the child who can observe the effects of actions and adjust them progressively, positive reinforcement and feedback, exploratory activity – should be present in appropriate software for early literacy (Casey, 1997).

Thorndike (1932) represents the original stimulus-response (S-R) framework of behavioral psychology: learning is the result of associations forming between stimuli and responses. The paradigm for S-R theory was trial and error learning in which certain responses come to dominate others due to rewards. The theory suggests principles of giving feedback to facilitate learning.

Rumelheart and Norman (1978) proposed that there are three modes of learning: accretion, structuring and tuning. Accretion is the addition of new knowledge to existing memory. Structuring involves the formation of new conceptual structures or schema. Tuning is the adjustment of knowledge to a specific task usually through practice. Rumelheart and Norman (1981) extended their model to include analogical processes: a new schema is created by modeling it on an existing schema and then modifying it based upon further experiences. The principles of modes of learning theory are that instruction must be designed to accommodate different modes of learning and practice activities affect the refinement of skills but not necessarily the initial acquisition of knowledge.

Schank (1975) outlined a contextual dependency theory that deals with the representation of meaning in sentences. The central focus of Schank's theory has been the structure of knowledge, especially in the context of language understanding. Building

upon this framework, Schank and Abelson (1977) introduced the concepts of scripts, plans and themes to facilitate story-level understanding. The key element of conceptual dependency theory is the idea that all conceptualizations can be represented in terms of a small number of primitive acts performed by an actor on an object. In Schank's theory (Schank 1986), all memory is episodic and organized around personal experiences rather than semantic categories. Generalized episodes are called scripts- specific memories are stored as pointers to scripts plus any unique events for a particular episode. Scripts allow individuals to make inferences needed for understanding by filling in missing information (i.e., schema). Script theory is primarily intended to explain language processing and higher thinking skills. A variety of computer programs have been developed to demonstrate the theory. Schank applies his theoretical framework to story telling and the development of intelligent tutors.

The functional context (Sticht 1975, 1976) approach to learning stresses the importance of making learning relevant to the experience of learners and their work context. Making it possible for the learner to relate it to knowledge already possessed, and transforming old knowledge into new knowledge facilitates the learning of new information. By using materials that the learner will use after training, transfer of learning from the classroom to the "real world" will be enhanced. The model of the cognitive system underlying this approach emphasizes the interaction of three components of the knowledge base (i.e., long term memory) of what the individual knows, processing skills including language, problem-solving, and learning strategies, and information displays that present information. The performance of a task requires knowledge about what one is

reading or writing, processing skills for comprehension and communication, and displays of information to be processed.

These learning theories and research have contributed essential connections with beginning reading, which also can be included in categorizing instructional approaches employed in reading software. Results from reviewing learning theories and research related to early reading are important concepts. First, the early stage of reading depends upon phonemic awareness and letter-sound association. Also, young children learn to read in different types of reading. Meaningful reading in context and social interaction, such as communication among peers, plays an important role in reading development. Not only should reading challenge cognitive development or thinking skills, but also it should be enjoyable. Effective reading instruction should build and organize new knowledge, based upon a child's background knowledge and experiences, in a spiral, or series, manner from simple/easy to more complex/difficult. Modeling, scaffolding, and help are required. Good reading materials and activities involve appropriate levels of motor and mental ability of a child's certain stages of development. In addition, effective reading instruction includes readiness, exercise and practice, responses, and reinforcement.

Yet, principles from the learning theories above do not provide comprehensive perspectives for determining effective reading software for young children. Probing more on reading theories and what research says about early reading is essential. The long-lasting debate in reading theories or approaches, phonics versus whole language, that still are underlying early reading practices in school today also influence reading software development.

The Teaching of Phonics

Adams (1990) defined phonics as "a system of teaching reading that builds on the alphabetic principle, a system of which a central component is the teaching of correspondences between letters or groups of letters and their pronunciations" (p. 50). Adams (1990) also stated that virtually every reading program teaches phonics at some level. Educators generally agree that children learning to read and write English need to understand that there is a relationship between letter patterns and sound patterns in English (the alphabetic principle), to internalize major relationships between letter and sound patterns, and eventually to develop an awareness of the *separate* sounds in words (phonemic awareness). Educators also agree that emergent readers and writers need to develop a functional command of what is commonly called phonics. However, this does not necessarily mean that children should be taught phonics intensively and systematically through special phonics programs or even through phonics lessons in basal reading books and workbooks. Indeed, various lines of research argue for helping children develop phonics knowledge in the context of reading and enjoying literature and in the context of writing, rather than through isolated skills lessons.

Research does not strongly support the teaching of phonics intensively and systematically -- and certainly not phonics first. At best, systematic phonics, in comparison with traditional basal-reader or whole word approaches, may produce better scores on reading comprehension tests, but only through grade three (Chall, 1967, 1983). A study suggests that an approach which emphasizes phonemic awareness and phonics may get children off to an earlier start in grasping letter/sound relationships and reading words than an approach that embeds phonics in a whole literacy context, but the direct

instruction, whole language, and embedded phonics groups showed no significant differences in comprehension. Overall, there is little evidence that one form of phonics instruction is strongly superior to another in developing phonics knowledge and phonemic awareness (Stahl, McKenna, & Pagnucco, 1994).

From 1985 onward, a small body of experimental research has typically compared traditional skills instruction with whole language instruction in reading and writing in primary grade classrooms. Though many of the differences are not large enough to be statistically significant, the children in whole language classrooms scored the same or higher on virtually every measure in every study, including standardized tests and subtests that assess phonics skills (Weaver, 1994b; Tunnell & Jacobs, 1989).

Research on how children learn to read and write in the home indicates that children can become literate in much the same way as they learn their first oral language, though of course the processes are not exactly the same. Babies and toddlers learn oral language without teaching the rules for putting words together to make grammatical sentences. Similarly, one does not need to teach children phonics rules if they are given plenty of guided opportunities to learn letter/sound patterns (Cambourne, 1988; Holdaway, 1979; Smith & Elley, 1995; Stephens, 1991; Weaver, 1994b). It appears that for most children, phonics and phonemic awareness are learned and used when taught in the course of learning to read and write. Other children can be given additional tutorial help as needed.

Most young readers are not good at learning analytically, abstractly, or auditorily (Carbo, 1987). Therefore, for most young children, it is harder to learn phonics through part-to-whole teaching, which teaches phonics first, than through whole-to-part teaching,

which teaches reading and writing first and phonics is learned from and along with the words in familiar texts. Without using direct phonics programs, parents and teachers can do various things to help children gain phonics knowledge in the context of meaningful reading and writing and language play, such as reading and rereading favorite nursery rhymes, poems, songs, and stories to reinforce the patterns of the language; reading alphabet books to and with children; discussing words and making lists, word banks, or books of words that share interesting spelling/sound patterns; encouraging children to play with letters and to explore letter/sound relations, such as writing the sounds they hear in words; and helping children use prior knowledge and context plus initial consonants to predict what a word will be, then looking at the rest of the word to confirm or correct (Cunningham, 1995; Griffith & Olson, 1992; Mills et al., 1992; Powell & Hornsby, 1993; Weaver, 1994a;).

Research on Phonics and Effects of Reading Instruction

Of course fluent readers can identify many words at sight. However, when reading texts rather than word lists, proficient readers use prior knowledge and context along with letter/sound knowledge as they identify words and construct meaning (e.g., Goodman, 1973; Smith, 1988). Even though readers may see all the letters of a word, it appears that they identify the word before recognizing all the letters separately. Many poorer readers are ones for whom phonics was overtaught, with little or no emphasis on trying to make meaning while reading (e.g., Carbo, 1987; Chomsky, 1976; Meek, 1983). Too much emphasis on phonics encourages children to use "sound it out" as their first and possibly only independent strategy for dealing with problem words (Applebee, Langer, & Mullis, 1988).

Programs for teaching phonics often emphasize rules rather than patterns and focus on "separate" sounds, called phonemes. In contrast, the most effective and efficient phonics instruction focuses children's attention on noticing letter/sound patterns in the major components of syllables: that is, on noticing the letter/sound patterns in initial consonants and consonant clusters and in the rime, which consists of the vowel of a syllable plus any following consonants, such as -ake, -ent, -ish, -ook (Moustafa, 1996).

Recent research demonstrates that in classrooms where phonics is taught in the context of rereading favorite stories, songs, and poems, children develop and use phonics knowledge better than in classrooms where skills are taught in isolation. Similarly, phonics knowledge is developed by encouraging and helping emergent writers to spell by writing appropriate letters for the sounds they hear in words (Weaver, 1994b).

Effective reading instruction helps children learn to use phonics knowledge along with their prior knowledge and context, rather than in isolation. For example, children can be encouraged to predict words by using prior knowledge and context along with initial consonants, then to look at the rest of the word to confirm or correct their prediction. Researchers agree that children need to develop and use what are sometimes called "basic skills," such as the ability to use phonics knowledge in reading, the ability to spell conventionally, and the ability to use grammatical constructions effectively and according to the norms of the communities with which they want to communicate. The ability to use these skills is best fostered by teaching them in the context of their use.

Considering the major theoretical differences and the resulting emphases, it is particularly noteworthy that researchers and educators from various backgrounds are beginning to converge on four major points about the teaching of phonics. That is,

children should be given some explicit, direct help in developing phonemic awareness and a functional command of phonics. Such direct teaching does not need to be intensive and systematic to be effective. On the other hand, worksheets and mindless drills are not the best means of developing phonics knowledge; instead, phonemic awareness and phonics knowledge can be developed without instruction, simply while reading and writing whole and interesting texts (Cunningham, 1990).

Overall, researchers and educators with different backgrounds seem to be moving toward consensus on at least some aspects of how phonemic awareness and phonics should be taught: indirectly, through extensive reading and writing; directly too, but not necessarily in great detail; not through worksheets and drill, but with guidance in examining letter/sound patterns in the meaningful texts that children read and write. However, teaching phonics in context and through discussion and collaborative activities seems to be more effective with more children than other means. Children in classrooms where skills are taught in the context of reading and writing whole texts get a better start on becoming proficient and independent readers, not mere word-callers (Kasten & Clarke, 1989; Stice & Bertrand, 1990).

Whole Language

> "Whole language is not a program, package, set of materials, method, practice, or technique; rather, it is a perspective on language and learning that leads to the acceptance of certain strategies, methods, materials, and techniques." (Watson, 1989)

The advent of whole language is often traced to the mid-to-late 1970s, when Kenneth Goodman (1979, 1989) and others' insights into reading as a psycholinguistic process gained increasing recognition. This perspective or educational theory derives

from several kinds of research: research demonstrating the psycholinguistic and social nature of the reading process, research demonstrating how children acquire language and how learning to read and write is similar to learning the basic structures of the language as children learn to talk; and research on how humans learn concepts and ideas. In fact, one way of characterizing whole language is to say that it is a "constructivist" view of learning, with particular emphasis on the development of literacy. Derived from research in cognitive psychology, constructivism asserts that human beings develop concepts through their own intellectual interactions with and actions upon their world. Learners and learning are not passive, but active.

Forming concepts about language - oral or written - is easier when learners are presented with whole, natural language, not unnatural language patterns like "Nan can fan Dan," not the vastly simplified language of some primers in basal reading programs, and not the bits and pieces of language found in many workbook exercises and skills programs. Hence the term "whole language."

Harste (1989) and Weaver (1990) give some key characteristics of whole language education as follows.

Acceptance of learners. This means, in part, that whole language teachers develop the classroom environment and the curriculum for and with the students, to meet their needs and engage them in learning about what interests them, as well as to cover essentials from the curriculum guidelines.

Flexibility within structure. Instead of having children do one brief activity or worksheet after another, whole language teachers organize the day in larger blocks of time, so that children can engage in meaningful pursuits. They may have a readers' and

writers' workshop, for instance, when the children read books and perhaps use them as models for their own writing. They may study a theme or topic using oral and written language and research skills to pursue learning in other content areas, and using language to demonstrate and share what they have learned. Together and individually, the students have many choices as to what they will do and learn, which enables them to take significant responsibility for their learning and to accomplish something meaningful and significant.

Supportive classroom community. Many whole language teachers help children develop skills for interacting with each other, solving interpersonal conflicts and problems, supporting one another in learning, and taking substantial responsibility for their own behavior and learning. Whole language teachers have discovered that virtually all children can learn to read and write whole texts. Indeed, reading whole texts is often easier for these children than doing the skills work.

Skills taught in context. Instead of being taught in isolation, skills are taught in the context of students' reading, writing, and learning. For example: phonics is taught mainly through discussion and activities deriving from texts the children have read and reread with the teacher, and through writing the sounds they hear in words. Spelling is mainly taught when children are editing their writing, and grammar is mainly taught as the teacher helps children revise and edit what they've written. In short, skills are taught while students are engaged in real-life tasks.

Teacher support for learning: scaffolding and collaboration. Teachers provide "scaffolding" for learning in many ways. Whole language teachers help children write the sounds they hear in words, thus enabling the children to communicate through writing.

They collaborate with children in carrying out research projects and, in the process, they model and explain how to do things that the children could not yet do alone. By collaborating on projects, children provide similar support for each other.

Contextualized assessment that emphasizes individuals' growth as well as their accomplishments. Assessment is based primarily upon what children are doing from day to day as they read, write, research topics of interest, and express their learning in various ways. Portfolio assessment, that includes data not only on the products of children's efforts, but also on their learning processes, is usually applied.

Research on Whole Language Instruction

Research demonstrates that skills taught, practiced, and tested in isolation are not used as consistently or effectively as skills taught when children are actually reading and writing. In spelling, children who are encouraged to spell words as best they can when they write typically score as well as or better on standardized tests of spelling by the end of first grade than children allowed to use only correct spellings in first drafts. Meanwhile, the children encouraged to spell by writing the sounds they hear in words seem to develop word recognition and phonics skills sooner (Clarke, 1988). They also use a greater variety of words in their writing. Extensive exposure to print and reading helps children internalize not only the spellings of particular words, but spelling patterns (Moustafa, 1996). Just as children learn the patterns of the spoken language from hearing it, children learn patterns of the written language from reading and rereading favorite texts. Texts with regular patterns like "Nan can fan Dan" are not necessary, however, nor are they even as readable as texts written in natural language patterns.

The reading/writing workshop, for example, reflects a whole language philosophy because it encompasses reading, writing, speaking, and listening in a meaningful context (Foster, 1994; Strickland & Strickland, 1993). Electronic storybooks fall in the whole language perspective. The story is read and the words on the page are highlighted as they are read. Many of the objects on the screen become active if they are clicked – they dance, sing, play, make humorous comments, and do funny things. Children can read along at their own pace and rehear those words that are challenging to them. Because the electronic books are so very appealing that children spend long periods of time exploring each screen, children learn the letter/sound relationship as spoken word and written word are connected. However, electronic books neither contain an instructional approach nor skill practice. Learning progress cannot be assessed nor traced. Nevertheless, reading software that provides opportunities for writing, such as creating greeting cards and writing stories which reinforce letter/sound and picture/word relationships, is considered as software that employs the whole language perspective.

Direct Instruction

Many different approaches are used in reading instruction. For example, children learn to read in meaningful contexts. Teachers use a language experience approach to help children compose a story about their own experience based on the underlying assumption that children will learn to read better if much of the initial instruction is anchored around stories from their own experiences and involves words from their spoken vocabulary. Whole language instruction involves a complex process of learning to read that children might find difficult. As a result, the process is broken down into component skills. Lessons concentrating on those skills are created. This type of strategy

is called "direct instruction." Other names associated with this model are bottom-up instruction, skills instruction, skill and drill (Willis, Stephens, & Matthew, 1996).

In direct instruction, an objective is selected to be reached, the stage is set for learning (motivating), the skill is explained or modeled, guided and independent practice are provided, the students are evaluated and re-taught as indicated, and then the students are encouraged to use the skill in independent reading (Smith, 2000). An ideal direct instruction model consists of five steps (Willis, Stephens, & Matthew, 1996, p. 70):

1) Identify the skills that need to be taught (task analysis).
2) Assess the student's level of achievement on the tasks (diagnosis).
3) Teach the skills and subskills, monitor progress, adjust instruction as needed (monitored instruction).
4) Assess the success of instruction (exit tests).
5) Move on to the next skill (or next level of the same skill).

Most educational software supports the direct instruction model, but few include all five steps described above. In general the more steps included, the better. Some experts believe that direct instruction is a very successful approach that deserves much wider use (Carnine, Silbert, & Kameenui, 1990; Johnson & Pearson, 1975; Smith, Otto, & Hansen, 1978). Direct instruction is problematic because it is often based on behavioral learning theories that are now out of favor. Many educators today advocate whole language instruction that avoids the teaching of skills in isolation.

Research on direct instruction

However, there is a sizable body of research supporting direct instruction. For example, from the follow-up studies (Gersten, 1988; Stalling, 1987) of Follow Through, the federal program that comes after Head Start and is for students in kindergarten through third grade, it was determined that the students in programs based on the direct

instruction model had higher achievement in reading and math when compared to the students in traditional and Montessori programs.

From the review of the research, Samuels (1988) concluded that decoding the symbols of written English is a critical prerequisite for reading that is best learned from direct instruction and extended practice with reading material that is at the child's instructional reading level. In addition, direct instruction was found more effective than other types of instruction when reading comprehension was the objective (Readence, 1986). Also, other studies suggest that direct instruction methods are superior for teaching vocabulary (Ed & Cockrum, 1985), reading comprehension (Stevens, 1991), and phonics (Snider, 1990). As a result, direct instruction has some value in teaching reading.

Direct instruction oriented software and teaching of phonics

Direct instruction is a skills-based approach often employed in software programs that emphasize particular reading skills or tasks for learners to master. Teaching of phonics usually employs bottom-up instruction that is conceptually under the umbrella of the direct instruction model. In Phonics Online, Smith (2000) states that phonics instruction benefits most from direct teaching that is systematic. Therefore, reading software that teaches phonics employs a skills-based direct instruction approach, usually out-of-context direct instruction in which a skill is taught in isolation (Willis, Stephens, & Matthew, 1996). For example, they separate the phonics lessons from the act of reading and teach phonics skills in isolation until these skills become automatic and then help the student apply them to the process of reading. In grammar instruction, an element such as verbal is removed from its context, practiced through worksheets, and applied to the process of writing. Willis, Stephens, and Matthew (1996) purported that the two most

common forms of out-of-context direct instruction software in use today are drill and practice and tutorials software.

Vocabulary and Grammar Instruction in Early Reading

Vocabulary or word knowledge has particular importance in reading. It contributes significantly to reading achievement as well as in other subjects of the school curriculum, such as speaking and writing. Most people feel that there is a common sense relationship between vocabulary and comprehension - messages are composed of ideas, and ideas are expressed in words. Most theorists and researchers in education have assumed that vocabulary knowledge and reading comprehension are closely related, and numerous studies have shown the strong correlation between the two (Nagy, 1988; Nelson-Herber, 1986).

It is generally accepted that students learn vocabulary more effectively when they are directly involved in constructing meaning rather than in memorizing definitions or synonyms. Certainly vocabulary knowledge can be acquired through reading and discussions about certain contexts (Nagy et al., 1985). But it appears that direct instruction is more effective than incidental learning for the acquisition of vocabulary, and also more efficient (McKeown & Beck, 1988). However, in one study of fourth graders that examined whether a context or a definitional approach was better for vocabulary development, Szymborski (1995) found that there was no significant difference in raw scores between the samples using the two different approaches.

Grammar is another issue in reading. However, decades of research demonstrate that teaching grammar as a school subject does not improve most students' writing, nor even the "correctness" of their writing (Hillocks & Smith, 1991). What works better is

teaching selected aspects of grammar (including sentence variety and style, punctuation, and usage) in the context of students' writing-that is, when they are revising and editing their writing (Calkins, 1980; DiStefano & Killion, 1984; Weaver, 1996). For improving editing skills, it is most effective and efficient to teach only the grammatical concepts that are critically needed for editing writing, and to teach these concepts and their terms mostly through minilessons and writing conferences, particularly while helping students edit their writing.

Research shows that systematic practice in combining and expanding sentences may increase students' repertoire of syntactic structures and may also improve the quality of their sentences, when stylistic effects are discussed as well (Hillocks & Smith, 1991; Strong, 1986). Thus sentence combining and expansion may be taught as a means of improving sentence variety and style. However, isolated activities are not necessarily any more effective than minilessons and writing conferences in which teachers help students rearrange, combine, and expand their sentences for greater effectiveness.

From reviewing the reading theories and related research, it is becoming clear that early reading, learning and instruction, employs a variety of activities associated with the target language, English. Learning to read includes a variety of activities that need social interaction, individual learning, meaningful context, modeling and scaffolding, and different instructional approaches to make learning more effective. In creating or designing reading software for young children, publishers must take this prevailing knowledge into account seriously.

Important Features of CBI Designed for Young Children

Computers are a new technology widely used as a tool for assisting instruction and improving learning. Virtually, the computer has its own specific aspects that work properly and are different from other learning materials. Working with a computer requires certain knowledge and skills. If children lack certain computer knowledge and skills, they would have a problem and might not be able to gain what they need to learn when using computer software. Polson and Richardson (1988) posit that the learner working with a computer generally has two problems. First, the learner must learn some subject matter that he or she may not understand. The other problem is that the learner must use the technology itself in order to learn and is likely not an expert user. If the computer software is poorly designed, a training session will probably be ineffective. Simply put, if the learner has to spend significant intellectual energy working with the computer or figuring out how the software works, then the learner has less intellectual and emotional energy for learning what is supposedly being taught. Therefore, computer software needs to be appropriately designed in order to focus the learner on learning what is being taught. Generally, there are three significant considerable aspects that should be included in designing computer-based instruction (CBI) software for young children: (a) cognitive theory; (b) formats; and (c) features.

Cognitive Theory for CBI Software Design

Research studies have been conducted attempting to prove that using the computer to teach something is better than using a book, a teacher, a film, or some other more traditional methods. Different media have different advantages. Overall, a very small effect in favor of CBI over instructional methods without using computer has been

claimed from reviews of the studies (Kulik & Kulik, 1986). Researchers argued that the lower effect of CBI was caused by its poor design. High quality and creative instructional design with careful evaluation are necessary. The computer's particular capabilities can be beneficial in reading instruction where extensive individual student practice is needed, such as vocabulary and responses to reading, and student motivation is lacking (Alessi & Trollip, 1991).

As a general rule, Alessi and Trollip (1991) posit that an effective instructional computer program, or courseware, should employ four phases: (a) presenting information or modeling skills; (b) guiding the student through initial use of the information or skills; (c) practicing by the student for retention and fluency; and (d) assessing student learning. In everyday classrooms, the computer can be one element in an instructional environment, along with teacher and other media. The computer may serve one or a combination of the four phases. However, when the computer is responsible for total instruction, it is important that all four phases be included.

In addition to the phases of instruction, Alessi and Trollip (1991) advocate that cognitive psychological theory plays a very important role in courseware or software design. The areas of cognitive theory that are believed to be most essential to the design are those relating to perception and attention, memory, comprehension, active learning, motivation, locus of control, transfer of learning, and individual differences.

Perception and attention

Effective instruction depends on presentations designed for easy and accurate perception. Perception may be facilitated by many presentation design factors: detail and realism, the use of sound versus visual, color characteristics of text such as its size and

font, animation, and position of screen elements. For perception of proper lesson elements to occur, the attention of the student must not only be initially attracted but maintained throughout the lesson. In addition, attention includes level of student involvement, personal interests and prior knowledge of the student, lesson difficulty, novelty and familiarity, pacing, and variety.

Memory

Much of what learners perceive they must store and be able to retrieve later. While the information storage and retrieval capacity of human intelligence is immense, assuring that the important things are not only perceived but also properly stored is not trivial. Especially when faced with new and large bodies of information, such as the vocabulary of a new language, instructional techniques for efficient storage of information are essential. Two principles underlining almost all methods of enhancing memory are the principle of organization and the principle of repetition (Fleming & Levie, 1978). In general organization is easier and more powerful. Showing the students the organization of new information or imposing organization upon it aids recall. When the use of organization of new information is inappropriate or impossible, the use of repetition is often used.

Comprehension

Principles of concept acquisition and rule application guide CBI design. What a student perceives must be interpreted and integrated into his or her current knowledge of the world. The student must not only store and retrieve information but be able to classify it, apply it, evaluate it, manipulate it, and so on. These principles include prior knowledge, defining and exemplifying concepts, rule application, and information.

Active learning

Students not only learn by observing but by doing. Interaction not only maintains attention but also creates and stores new knowledge and skills. One of the essential features of computer courseware in contrast to some other media is its capacity to require and act upon student interactions.

Motivation

Proper motivation is essential to learning. CBI can enhance motivation by using simulation and gaming, which contain elements of challenge, curiosity, control, and fantasy.

Locus of control

A crucial design variable in all CBI is instructional locus of control, which means whether control of sequence, content, methodology and other instructional factors is determined by the student, the lesson (actually the lesson author) or some combination of two. In reality, all lessons have a mixture of student and lesson control. Whether the lesson is successful depends on which aspects of instruction are controlled by the student and which by the lesson. While the potential for flexible student control is an often claimed advantage of CBI (Laurillard, 1987), its effects on motivation and learning are complex.

Transfer of learning

Transfer refers to the extent to which improved performance in the lesson is reflected in the real world. Transfer is affected by type, amount, and variety of interaction, by realism of the instruction, and by the methodologies used. In training

situations, transfer is ultimately the most important instructional outcome. Learning in a CBI lesson is usually a precursor to applying or using that knowledge in the real world.

Individual differences

Students do not all learn alike or at the same rate. Some instructional methods are better for some students. An advantage of CBI is its capability to individualize. However, just like interactivity, this supposed advantage is not often utilized. Most commercial software works about the same for all students. Good software will adapt to the learner, capitalizing upon his or her talents, giving extra help where the student is weak, and providing motivators each student responds to. Because not every lesson will work for every student, matching students up with appropriate lessons and methodologies is important. That in turn depends on continual assessment of individual differences so that proper matching and other decision making can take place (Alessi & Trollip, 1991).

These eight issues are recommendations on computer screen design, lesson sequence, interaction techniques, and evaluation. Other important aspects of computer software used for instruction and learning are types of software created. It is essential for software evaluator to know types of the software and their purposes being evaluated in order to determine the most appropriate software for certain lessons and students.

Format of CBI Software

According to the notion that successful instruction should include four activities of information presenting, guiding student through initial use of information and skills, practicing for retention and fluency, and assessing student learning, there are five types of software created currently (Alessi & Trollip, 1991): tutorial, drill and practice, simulations, games, and tests.

Tutorial

Courseware created for tutorial lesson aims to satisfy the first two components of instruction - presenting information and guiding student through initial use of the information and skills. Tutorial lessons usually do not engage in extended practice or assessment of learning. Some tutorials do not even guide the student through the information, but only present it. Tutorials are used in almost every subject area. They are appropriate for presenting factual information, for learning rules and principles, or for learning problem-solving strategies.

Drill and practice

Drill and practice courseware is similar to drills with workbooks, flashcards, or a teacher, except that computer-based drills can be made more interesting through competition, the use of graphics, informing the student of progress, and introducing variety. The use of interactive graphics can increase the effectiveness of drills in ways that workbook and flashcards can not. The use of graphics as a prompt, as a context, as a motivator, and as feedback can all serve to make computerized drills more effective than other types of instructional media. Today courseware for children combines drills and practice with other types, such as simulation and games.

Simulations

A simulation is a powerful technique in an educational context. A simulation teaches about some aspect of the world by imitating or replicating it. Students are not only motivated by simulations, but also learn by interacting with them in a manner similar to the way they would react in a real situation. In almost every instance, simulation also simplifies reality by omitting or changing details. In this simplified

situation, a student solves a problem, learns procedures, comes to understand the characteristics of phenomena and how to control them, or learns what actions to take in different situations.

Simulations differ from interactive tutorials, which help the student learn by providing information and using appropriate question-answer techniques. In a simulation the student learns by actually performing the activities to be learned in a context that is similar to the real world. Simulations have a number of advantages as instructional tools as compared to using the real world as the classroom, such as airplane control training. These range from being able to enhance safety, to provide experiences not readily available in reality, to modify the time frame, to control the complexity of the learning situation for instructional benefit, and to save money. Because they are close to real situations, simulations typically have advantages over tutorials, drills, and tests in that they enhance motivation, have better transfer of learning, and are more efficient.

Instructional game

Games are another powerful instructional tool that are becoming more prevalent with the proliferation of computers in school. They are very much like simulations. The purpose of both simulations and games is to provide an environment that facilitates learning or the acquisition of skills. Simulations attempt to do so by mimicking reality; many simulations are also quite entertaining, but entertainment is not one of their distinguishing features. Conversely, games may or may not simulate reality, but they are nearly always characterized by providing the student with entertaining challenges that facilitate learning.

Test

For many years, computers have been used to construct and score tests. Such help takes a variety of forms. For example, written test questions can be stored in pools called item banks that can be accessed whenever tests are needed. Computers can assemble questions into test formats in many alternative ways. Computerized test construction utilizes the computer to generate, print, score tests, analyze, and interpret the test-score. With the proliferation of microcomputer and computer networks, it is now feasible to administer tests directly to students right at the computer or terminal. Though computerized tests offer advantages and have limitations, wisely used they can save a substantial amount of time and can frequently improve the quality of testing.

In sum, most of the single early reading software available in today's market combines different types of software programming to facilitate effective learning and a diversity of learning styles. In addition, not only are types of software programming important, but also some other features are essential for effective learning.

Important Features of CBI Software

There are many instructional factors, or characteristics, under the designer's control which affect appearance and effectiveness. In terms of instructional methodology, what appears on computer screen motivates and facilitates learning. Following are features that should be considered when evaluating early reading software for children.

Introduction of the lesson

All types of software should begin with an appropriate introduction that attracts the student's attention, creates a receptive attitude, and indicates in a general way what the lesson is about. The introduction should include the title page, presentation of

objectives, directions, stimulating prior knowledge and/or pre-testing, if necessary, that determine student readiness and need for a lesson.

Mode of presentations. Mode of presentation means whether information is presented to the student as text, graphics, sound, or a combination of these. Text is the most common way to present information. Graphics are also used in the presentation of visual information that is not text. Graphic presentations, including animation pictures, greatly enhance instruction about spatial relationships, about objects or procedures that can be visually depicted, or for modeling. Sound, music or speech, is necessary for learning when the information itself is of an aural nature, especially in early reading instruction. Sound is useful for conveying temporal information such as poetic meter, rhyme, song, and even reading aloud. Sound is also good for attracting attention even if the student is not looking at the screen.

Length of text presentations. Presentation should be short to increase the frequency of student interaction. The more complex the information is, the more important it is to break it into steps with student activity for each step. Appropriate length depends on the subject matter and the age level of the student.

Layout of text. Letters, words, sentences, and paragraphs should be well formatted. Sizes of text and spacing have an effect on the readability of text and also attractiveness. Any emphasis technique should be used in moderation.

Graphics and animation. A major consideration regarding the effectiveness of graphics and animation information is the importance of the information presented. Attention should be focused on the importance of information in a lesson rather than the unimportant information (Fleming & Levie, 1978) Pictures, especially animated ones,

capture attention more than text. Thus graphic presentations should be chosen based on what is important in the text. Unfortunately, authors frequently produce graphics that are artistically excellent, but are not instructional useful. Graphic information should be consistent with and integrated into the rest of the instructional message

Color and its use. Color is effective for attracting attention. However, the more color is used the less it will do so, because attention is always drawn to what is novel. The attention-getting effect of color can and should be used, like that of graphics, to attract attention to important information. Color use should also be consistent with common usage in society. Using green to mean "stop" and red for "go" will result in errors.

Student control of the lesson. One of the most complex aspects of designing lessons is student control, what control to give and the method of control, or menus that the student can click on, by using the mouse. Although software has recently encouraged mouse buttons and pull-down (or pop-up) menus everywhere on the display, Allesi and Trollip (1991) recommend buttons consistently placed on the bottom and pull-down menus at the top.

Response. Psychologically, response is crucial for the reinforcement of learning. Therefore, software designed to assist learning must provide opportunities for response by the learner. Most response CAI lessons today attempt to identify correct response, anticipate several incorrect responses, and treat unanticipated responses as incorrect. The program should have a 'student control' mode that enables student control of at least some aspects of the lesson including such things as reviewing sequences already presented, skipping sequences, and requesting hints or help. Correct answer and feedback

should be provided as well as 'give up' response, the option to exit the lesson. In short, Chambers and Sprecher (1983) advocate that response is very important because it enables aspects of the lesson as presentation, pace, and sequence to vary, depending on the individual needs and learning styles of the student. Providing appropriate help and opportunity to end a lesson are also necessary for individual learners.

Motivation. Malone (1981), in his research, suggested three relevant factors: challenge, curiosity, and fantasy.

First, the lesson should not be too easy, but also not too difficult. The most important principle is that the challenge should be adjusted for the student. Setting challenge goals at the start of the lesson is beneficial. Having uncertain outcomes, wherein the student is not sure if they are attainable or not, increases challenge. Varying the difficulty level of a lesson as student performance improves will maintain challenge throughout the lesson.

The second factor of motivation is curiosity. Malone distinguishes this type of motivation as sensory curiosity and cognitive curiosity. Sensory curiosity is aroused by visual or auditory effects which are surprising or which attract attention. Cognitive curiosity is aroused by information which is surprising in that the information conflicts with student's existing knowledge or expectation, is contradictory, or is in some way incomplete. These situations encourage the student to seek new information that remedies the conflict. In short, good software should arouse student's curiosity to learn and engage in learning.

Third, fantasy situations are motivation that encourages the students to imagine themselves in a situation or that include vivid realistic images of an imaginary context or

event. Although fantasy is usually associated with games, there are many ways it may be incorporated in instructional methodologies. In any lesson, it may be valuable to encourage the students to envision themselves in a situation where they can really use the information they are learning.

Motivation is an essential aspect of instruction. A lesson may be perfectly sequenced and worded, yet still fail to teach if students become bored. Though motivation factors support learning, they must still be applied intelligently and in moderation and balance with other elements.

Ease of use. Frequently, most students quit using computer software because it is complicated and difficult to use or follow. Children are sometimes naïve in computer technology, therefore early reading software should be easy for them to follow or control.

Documentation. A software provider should provide a student and or teacher manual and other appropriate documentation, such as content validation, copyright, computer specification, publication, and contact information of the provider.

All of the aspects and features of computerized instructional software above are essential for designing reading-related software for young children. From the literature review, software should include a combination of formats. For example, single software might include tutorial, simulation, drill and practice, and instructional game. In addition, the software should provide presentation of validation of the content appropriate to children's abilities, motivation, and response. Text, graphics including animation and use of color, sound, speech recognition, feedback and help, curiosity (e.g., title, length of text, and layout), challenge (e.g., levels of difficulty, student control of lesson) are important considerations. Furthermore, the software should be easy to use. That is, it should provide

clear and appropriate buttons and menu and documentation, such as a user guide or manual. Although no one program is likely to exhibit all of the positive characteristics outlined above, they are presented here as a set of standards against which a good courseware can be measured.

Summary

From reviewing reading definitions, theories related to reading, and reading approaches and practice, there are essential aspects of learning and reading instruction that provide a framework for analyzing content of reading software designed for young children. Although there are different concepts and approaches of how to teach reading effectively (i.e., phonics which is opposite to whole language), educators recommend a balanced use of approaches (Weaver, 1994a, 1994b). However, the important features in learning to read and reading instruction for young children include: (a) phonics instruction that teaches alphabetic knowledge, letter-sound relationships, words and their meanings or vocabulary (Griffith & Olson, 1992; Holdaway, 1979; Nagy, 1988; Nelson-Herber, 1986), spelling and grammar (Hillocks & Smith, 1991; Moustafa, 1996) and knowledge about print, (b) instructional approach that emphasizes meaning in variety of contexts, such as story reading comprehension, language play, songs and rhymes, listening and speaking activities, and writing activities (Foster, 1994; Strickland & Strickland, 1993), and (c) reading and language activities that consist of a variety of meaningful and enjoyable activities. Reading instruction is built on child's developmental stages and is challenging, motivating, and related to background knowledge. Instructional activities are provided with examples of learning task, or modeling, skill practicing or

exercises that are spiraling or contain levels of difficulty and strategy, as well as responses or feedback to monitor learning (Alessi & Trollip, 1991; Balajthy, 1996).

As these components are translated into classroom experiences, children will have opportunities to talk, read, and write in many ways as they use language both inside and out of the classroom. Because the language arts (reading, writing, listening and speaking) are so interrelated, children must be given the opportunity to practice the strands of language arts in connected and purposeful ways (Willis, Stephen, & Matthew, 1996).

Since the advent of computer-based instruction, development of reading software is gradually becoming more commercialized (Balajthy, 1996). A variety of computerized instructional methodologies and programming methodologies, such as games and simulations that make learning more motivating and enjoyable (Alessi & Trollip, 1991), are employed in commercial reading software especially designed for young children. Publishers of children's software compete for market share by attracting more consumers to buy. However, no one knows for sure whether commercial reading software programs available for young children employs appropriate instructional methods and provides appropriate and sufficient content, or are just games for fun.

By investigating to answer the research questions that focus on 1) the content of commercial reading software, 2) the instructional methods employed, 3) the reading models employed, 4) the programming methodologies used, and 5) the other features utilized to make the instruction more appealing in commercial reading software programs designed for Pre-K through third grade children, this study will provide information and recommendations to assist parents and teachers in pursuing, selecting, and using commercial reading software programs to assist their children’s learning to read.

CHAPTER 3

METHODOLOGY AND PROCEDURES

The Methodology

The Population

Publishing of personalized CD-ROM-based reading software has grown rapidly since the use of computers for literacy instruction has been advanced. A variety of reading software classification schemes have been commercialized, such as phonics (Bowman, 1999), electronic storybook, vocabulary or word study, reading skill and practice, reading comprehension, reading and writing, reading test, combination of reading skills, and reading development for multilingual or multicultural programs (Balajthy, 1996). Currently, hundreds of commercial software entitled or described as "reading software" for Pre-K through third grade children are published.

Despite the variety of schemes of the reading software, electronic storybook and reading test software were not included in this study since they are not designed directly to assist reading instruction. Also, the reading software designed specially for multilingual, such as English as a second language (ESL), or multicultural reading programs were not included because they contain other characteristics (e.g. languages other than English and specific ethnic background) beyond the scope of this study. This study included commercial reading software focusing on instruction attempting to develop reading ability for Pre-K through third grade children in general. In a single reading software program, one or two schemes, or combination of schemes may be included. The commercial reading software were published in CD-ROM format. In

addition, this investigation focused on viewing the commercial reading software designed for personalized use that can be run in both Window PC and Macintosh System platforms.

Content Analysis

This study employs primarily one form of qualitative methodology, content analysis. Therefore, it is descriptive in nature. The researcher is the primary instrument for collecting data, categorizing the data, and interpreting the meaning of the results of the data collected. The commercial reading software designed for Pre-K through third grade children was selected and analyzed and the analysis was done inductively. The object of the study is the content viewed from the commercial reading software CD-ROMs, classified as "communication media" (Gall, Borg, & Gall, 1996 p. 357), that comprises interesting messages, such as subject matters and instructional methods, related to early reading.

In the past, researchers viewed content analysis as a qualitative method, a way ethnographers or qualitative researchers used to analyze data (Goetz & LeCompte, 1984). Although content is analyzed in some systematic and quantifiable way, Howard (1985) included content analysis in qualitative methodology.

Content analysis has been defined as “a research technique for the objective, systematic, and quantitative description of the manifest content of communication” (Berelson, 1952, p. 18). Patton (1987, 1990) defined content analysis as the process of identifying, coding, and categorizing the primary patterns in the data. It is used by qualitative researchers to analyze the content of interviews and observations. The materials for content analysis can be any type of document or other communication

medium, such as written documents, visual media, audio media, and combination of media (e.g., TV programs and CD-ROM discs) (Gall, Borg, & Gall, 1996). Weber (1990) states, "content analysis is a research method that uses a set of procedures to make valid inferences from text" (p. 9). The inferential process varies with the theoretical and substantive interests of the investigator. Therefore, content analysis can be used for many purposes for investigating content of communication. For this study, the purpose of analyzing the content of commercial reading software was to identify and describe the intentions and other pedagogical characteristics employed in the commercially designed software.

"The central idea in content analysis is that many words of the text are classified into much fewer categories. Each category may consist of one, several, or many words. Words, phrases, or other units of text classified in the same category are presumed to have similar meaning" (Weber, 1990, p. 12). Content analysis has been applied to the field of education since the early 1960s. Educational materials have provided researchers a rich source of data to make inferences about processes of reading and to understand other important characteristics and issues in education (Krippendorff, 1980). According to Krippendorff (1980), content analysis is a research technique for making replicable and valid inferences from data to their content. For research to be replicable, it must be clear which data will be analyzed, how the data will be defined, and from what population it will be drawn.

Holsti (1969, p.14) defined content analysis as “any technique for making inferences by objectively and systematically identifying specified characteristics of messages.” Objectivity stipulates that each step in the research process must be carried

out on the basis of explicitly formulated rules and procedures. Systematic identification means that the inclusion and exclusion of content or categories are done according to consistently applied rules. All aspects of the question must be investigated uniformly throughout all parts of a defined body of text. A content analysis design requires several steps to ensure its objectivity. These steps include data-making (unitization, sampling, and recording), data reduction, inference, and analysis. Krippendorff (1980) describes datum as a unit of information that is recorded in a durable medium, distinguishable from other data, analyzable from other data and by explicit techniques, and relevant to a particular problem. Sampling, unitizing, and recording are interrelated. For example, unitizing that involves identifying specific units or categories can be done in the recording phase of the analysis.

Budd, Thorp, and Donohew (1967) describe content analysis as the system or set of categories, which, in essence, is a conceptual scheme. Categories are the actual variables linked to the problem and the theories on which the research is based. Categories differentiate and describe the content being investigated and form a crucial link between the actual counting or measuring and the larger fields of theory and concept. Categories must accurately fit the needs of the study so that they answer the research questions. Also, they must be exhaustive and mutually exclusive. In other words, operational definitions of the variables must be precise and unambiguous (Holsti, 1969).

In defining content analysis, Holsti (1969) and Krippendorff (1980) commented on the quantitative requirement that is important in many scientific endeavors. However, qualitative methods have proven successful particularly in analysis of linguistic data. The

content analysis may involve data collection on various aspects that can involve simple classifications or tabulations of specific information (Gall, Borg, & Gall, 1996).

In summary, Fox and Hess (1972) assert that content analysis can be done quantitatively and qualitatively. The best content analytic studies utilize both qualitative and quantitative operations (Weber, 1985). It is able to combine ideas that are usually thought to be antithetical. Another advantage is that content analysis usually yields unobtrusive messages in which the sender of the message is not aware that it is being analyzed (Nachias & Nachias, 1981; Webber, 1985).

Units of Measurement

Content analysis involves two kinds of basic units of measurement -- the *recording (or coding) unit* and *context unit*. The recording unit is defined as the smallest body of the content in which the appearance of a reference is counted (Berelson, 1952) and scored, or characterized, and placed in a given category (Holsti, 1969). The recoding units can be separately described and analyzed in parts of sampling units that provide the basis for analysis. The distinction among the recording units is achieved as a result of a descriptive effort. The most common recording units are a word; a theme or assertion; a sentence; a paragraph; an item; a character, group, or object; and space or time.

The context unit is the body of material surrounding the recording unit. By defining a context unit for each recording unit, the researcher recognizes and makes explicit the fact that symbols codetermine their interpretation and they derive their meanings in part from the immediate environment in which they occur (Budd, Thorp, & Donohew, 1967; Holsti, 1969). The context units set limits to the contextual information that may enter the description of a recording unit (Krippendorff, 1980).

In this investigation, the text (oral and written) in the software is the recording unit. The software with its purpose, subject matter, presentation and instructional methods, etc., can be seen as an independent unit. Each software provides a context for making meaningful analysis. Therefore, it is designated as a context unit. The textual content recorded is categorized in accordance to related reading theories. Relying on the existing conceptualizations of early reading theories has more of a chance to contribute to the knowledge of using personalized software to aid children's learning to read since bias can be avoided by relating the study to the theoretical background (Carney, 1972).

The Sample

In selecting the sample, this study adopted the method of purposive sampling, in which the samples are likely to be information rich (Gall, Borge, & Gall, 1996). That is, for this study, the best commercial reading software is believed to be information rich. Therefore, the samples for this study were the commercial reading software evaluated as the best reading software in the market. Determining the best reading software as the samples for the analysis was processed in three steps. Step one, information related to reviews, ratings, and evaluation of reading software, including the best selling and award winning software, for Pre-K through third grade children, ages range from four to nine, was reviewed. Step two, criteria and evaluation forms were established as a guideline for selecting the software. Step three, the researcher selected the software for the analysis by using the criteria and evaluation rubric as the guideline.

Step 1: Reviewing of Reading Software Reviews, Ratings, and Evaluation

Children's Software Revue (2000), the prevalent magazine that provides comprehensive information of commercial reading software reviews, ratings, and

evaluation, listed Arthur's Reading Games, Dr. Seuss Preschool & Kindergarten, JumpStart Phonics Learning System, Phonics Writing Desk, Reader Rabbit's Reading Ages 4-6, and Reading Blaster Kindergarten as the best reading software for Pre-K children, ages 2-5. Casper Animated Early Reader, Madeline: 1st & 2nd Grade Reading Deluxe, Reader Rabbit's Reading: Ages 6-9, and Reading Blaster 1st and 2nd Grade were listed as the best reading software for early elementary children, ages 5-7, (p. 14-16).

From The Complete Sourcebook on Children's Software (Buckleitner, Orr, & Wolock, 2000), the reference book on children's software, reviews and star ratings (1.0 to 5.0 scale) of 1993 through 1999 software posted top 333 software titles related to reading. Arthur's Reading, Dr. Seuss's, JumpStart, Leap Ahead, Reading Blaster, and Reader Rabbit's, were the best (4.5 – 5.0 star-rating) software series of the top 333 reading-related software for Pre-K to third grade children (section 3, p. 28-31).

The Review Zone, the Internet website that reviews and evaluates educational software available in the market from 1996 to 2000, listed JumpStart 1st Grade, and Reader Rabbit's Interactive Reading Journey 1 & 2 as the best of 1996. Arthur's Reading Race, Disney's Animated Storybook: Hercules, Disney's Ready to Read with Pooh, JumpStart 1st Grade Reading, and Reader Rabbit's Kindergarten were the best of 1997. Reader Rabbit's Reading 2 was the best of both 1997 and 1998. Arthur's 2nd Grade, Dr. Seuss Kindergarten, and Reader Rabbit's Complete Learn to Read System were the best of 1999. In 2000, Reading Blaster: Ages 7-8, and JumpStart Phonics Learning System: Ages 3-8 were the best of reading-related software for young children (Velgos, 2001).

Superkids (1998-2001), an online service that provides parents and teachers a guide to educational software by reviewing, rating and evaluating commercial software

for children in terms of education value, kid appeal, and ease of use, listed Reader Rabbit's Preschool, Reader Rabbit's Kindergarten, Dr. Seuss Kindergarten Deluxe, and JumpStart Kindergarten as the best five-star software. JumpStart series (phonics, first, second, and third grade) and Reader Rabbit's series (preschool, kindergarten, first, and second grade) were the all-time bestseller reading-related software from 1997 to 2000. Arthur's Reading Race, Ready to Read with Pooh, and some animated storybook CD-ROMs, such as Toy Story, Aladdin, Lion King, and Winnie the Pooh were also in Superkids' bestseller categories in 1998-1999.

The Review Corner (Discovery.com, 2001) listed 34 reading-related software titles as the best (five-star ratings) educational software. JumpStart Phonics, JumpStart Reading for 2nd Graders, Phonics Based Reading Family Version, Reader Rabbit's Complete Learn to Read System, and Reading SOS were the best reading software of 1999.

Educational Software Institute (1995-2001), the online resource guide to educational software that provides descriptions for parents, educators, and students, listed 170 reading-related software products for Pre-K to third grade children. In their reading-related software list 28 software received the Teacher Choice Award. The award winning software are Let's Go Read 1-2 series, Reader Rabbit's Reading series, Word Works series, Arthur's Reading series, Dr. Seuss's series, Leap Into Phonics, Kid Phonics, and Spelling Blaster.

Apparently, many sources of commercial reading-related software reviews rated and evaluated similar software titles and series as the bestsellers, top-rating, or award winning software. Arthur's Reading, Dr. Seuss's, JumpStart, Reader Rabbit's, and

Reading Blaster series are the top-rating bestsellers of all educational software for children commercially available in the market. However, from reading the reviews from different sources it appears that reading software come in different subcategories, such as storybooks, reading games, spelling and grammar, and reading drill and practice. Furthermore, some of them are multi-subject software. That is, not only does it contain reading content but also it includes other subject areas (e.g., math, science, social study). Therefore, to determine the best software created to assist children learning to read only, a criteria and evaluation form for selecting the software was established.

Step 2: Establishing Criteria and Evaluation Form for Selecting the Software

The Software Selection Criteria

In accordance with the research purpose that focused on analyzing commercial software designed to assist children learning to read, the criteria used for selecting the sample were as follow:

(a) The software was produced in CD-ROM format designed for personalized use.

(b) The software title was literally labeled "reading," including "phonics."

(c) The software was created for Pre-K through third grade children, ages ranging from about four to nine.

(d) Storybook, reading game, and reading test software were not included since they did not attempt to assist learning to read directly.

(e) The software was published in a series, which the researcher believed, contains a developmental continuum of substantial content in early reading.

(f) The software was generally found in local and/or online stores where they could be easily purchased.

(g) The software could be run in Windows and/or Macintosh platform.

(h) The software was the latest version of publication.

The Software Evaluation Form

From the literature review focusing on relevant areas of computer-based instructional methodology, development of computer software for early reading, theories and practice of early reading instruction, and important features of computer-based instruction designed for young children (Chapter II), there are essential elements to be considered in evaluating the best reading software. To establish the evaluation form for selecting the software, thirty essential elements related to early reading were listed and divided into five categories: (a) reading content, (b) instruction and learning activities, (c) validation, (d) motivation features, and (e) technical support. A rating scale checklist-based was set for this software evaluation form in an attempt to quantify the factors in software design that have been associated with the effectiveness of reading software products for young children (see complete evaluation form in Appendix).

Step 3: Selecting the Reading Software

The software reviews, ratings, and evaluation from different sources identified around three hundred and thirty commercial software related to early reading, Pre-K through third grade, published from 1997 to 2000. Those reading-related software varied in purposes and types. After using the criteria to single out the software, forty-five of them remained to be evaluated for final selection. In the final evaluating process, reviews of the software from different sources were read. Then, the best reading software were selected as the samples for the study.

Based on the highest age range specified on the software packages, the selected software were designated into three groups for analysis. The sample software were as follows:

Pre-K to first grade

JumpStart Phonics, Age 3-6 (Knowledge Adventure, 1999)

Reader Rabbit Personalized Reading, Ages 4-6 (The Learning Company, 1999)

Reader Rabbit Learn To Read With Phonics, Ages 3-6 (The Learning Company, 2000)

Reading Blaster, Ages 4-6 (Knowledge Adventure, 2000)

Second grade

JumpStart Reading for First Graders, Age 5-7 (Knowledge Adventure, 1997)

Reading Blaster, Ages 6-7 (Knowledge Adventure, 2000)

Reader Rabbit I Can Read With Phonics, Ages 5-8 (The Learning Company, 2000)

Third grade

JumpStart Reading for Second Graders, Age 6-8 (Knowledge Adventure, 1998)

Reader Rabbit's Reading, Ages 6-9 (The Learning Company, 1998)

Reading Blaster, Ages 7-8 (Knowledge Adventure, 2000)

Procedures

Research Design

The purpose of the study was to identify, analyze, and describe the content and instructional approach employed in personalized commercial reading software designed for Pre-K through third grade children. Content analysis was chosen as the research

technique because it operates directly on communications between presenters and learners. When analyzing the content and instructional method employed in the software, the researcher used text, oral and written, as a recording unit and each software as a context unit. A *recording unit* is a specific segment of content examined by the researcher in order to place it in a category. A context unit is a larger context in which the recording units occur.

A content analysis research design required the establishment of categories for the coding process. Categories of reading content emerged from the software being analyzed. Categories were established and defined by the investigator. Three coding criteria lists were categories of: (1) phonics and instruction of phonics, (2) word recognition or vocabulary and its instruction, and (3) comprehension content and instruction. Then, the investigator interpreted and explained the results using relevant theories (Weber, 1990). In order to ensure the accuracy and reliability of the analysis, test of coding interrater reliability was adopted.

Validity and Reliability

In a content analysis study, the requirements for content categories that they be exhaustive and mutually exclusive are crucial to validity and reliability. Borg and Gall (1979) state that *validity* is the degree to which a measure actually measures what is intended to measure. According to Weber (1990), the validity in content analysis relies on the classification scheme, or variable derived from it and the interpretation relating content variables or categories to their causes and consequences. The content analyst often assumes content validity (also called *face validity*). This validation method presumes that a measure self-evidently measures what it is supposed to if the variables or

categories are rigidly defined and the coding has a high degree of reliability (Budd, Thorp, & Donohew, 1967). Berelson (1952) states, “in many content analyses the problem of validity is no problem at all” (p. 169). “In most cases, validity does not seem to be a major problem in content analysis. Most of the time, careful definition of categories and judicious and alternative selection of indicators will take care of the matter” (p. 171). In cases in which there is high agreement on the definitions of the relevant categories, achieving validity is a small problem in content analysis data.

Reliability is a measure of the replicability of the research result. Reliability is higher under these conditions: the simpler the categories and the unit, the more experienced and better trained the recorders (coders), and the more precise and complete the set of coding rule (Berelson, 1952). Hansen (1979) describes reliability as the dependent internal design problem in the qualitative study that raises the question of whether, within in a single study, multiple observers will agree.

To test reliability, interrater reliability coefficients are most often used. Krippendorff (1980) describes that interrater reliability involves the degree of similarity between the results of two or more coders rating the same thing at the same time. In this study, the researcher tested reliability of the category coding system by having one doctoral student use the coding system established for this study. This student was studying in the same program of Reading Education and in the same study time period (1997-2000) as the researcher. The researcher and the student independently analyzed the content draw from one of the sample software using the category coding system established. Then, the interrater reliability was determined by using Scott's interrater reliability formula (Wimmer, 1983):

$$\text{Reliability} = \frac{\%\ \text{observed agreement} - \%\ \text{expected agreement}}{1 - \%\ \text{expected agreement}}$$

Data Collection

Data from the selected reading software were collected. The data that was examined were drawn or transcribed from viewing the sample software. To determine the context units of the software (the context in which a recording unit occurs), first, the investigator studied each commercial reading software selected and identified the category – the particular structure in which the recording unit (a specific segment of content examined in order to place it in a category) is identified (Krippendorff, 1980). For each selection, the investigator studied the title and read the brief description on the software package provided by the publisher to have a basic idea about what the selection would be. Then, the investigator skimmed through the entire selection to know more about subject matter, method of presentation, the goals to be accomplished, and the important or key points that deserved attention.

After the previewing procedure was complete, the investigator had some understanding about the main categories of the reading software selection, such as alphabetic principle, letter-sound association, word knowledge, and comprehension. With this understanding in mind, the investigator began to draw details from each software program by viewing and transcribing. The investigator wrote the description from the observation and reexamined the description recorded in order to classify and put on certain index cards for further coding and categorizing.

Procedures for the Analysis of the Data

Since content analysis stands or falls by its categories (Berelson, 1952), the study is productive to the extent that the categories are clearly formulated and well adapted to the content. This study followed the grounded theory approach in which the theory is derived from data and then illustrated by characteristic examples of data (Glaser & Strauss, 1967). The process of categorization is described as follow:

Primarily, the investigator generated the categories of the data drawn from the reading software by reviewing the data description. The classification was based on the reading theoretical relevance for furthering the development of emerging categories. At this stage, the categories were given the names or labels. For example, phonics, word knowledge, story reading and comprehension, drill and practice skill-based exercise, and gaming strategy were named. Then the investigator classified the recorded units drawn from the transcription data into the categories established.

The second step was to view each software, transcribe and describe the content contained in the software. Then categories were set in each theme to determine which of the phenomena were different from or associated with each other and thus aggregated into groups. At this stage, the data were coded and grouped into different sets. Each group or set of data was put into separate cards or computer files. The preliminary or provisional categories and their properties, definitions, or descriptions were established. At this stage, labels reflecting the content of the data were added to the cards or files.

Step three was a mutual checking between the categories and groups or sets of data coded. The investigator read through each group or set of data on cards or files. Each card or file was compared with the particular category under which the cards or file had

been grouped. At this stage, regrouping of the data might have occurred and new categories might have been created when some data did not well fit the categories already established. Refining the original categories was also possible. This step was repeated until the categories and all data were properly refined and fitted into each other. The same specific data coded were tallied into the categories to determine how many and what percent of each particular set of data were included in certain categories. Finally the analyzed data were interpreted and described according to the research questions.

Summary

This study is a qualitative description of the commercial reading software designed for first through third grade children. The content analysis study followed the grounded theory approach that stands or falls by its categories. By viewing the sample software, transcribed data were drawn, then grouped, coded, and categorized. The quantitative method was also utilized to refine the data analysis. To determine the interrater reliability of the coding system established, Scott's formula was used.

CHAPTER 4

THE RESULTS AND FINDINGS

Introduction

The purpose of this study was to provide a content description of commercial reading software currently available in the market which targets early elementary children, Pre-K through third grade. The analysis information attempted to assist parents, teachers, and educators in the pursuit and selection of quality software to support reading instruction and children's learning to read. This study would also provide recommendations and suggestions for using reading software to enhance individual learning, such as using software with personal computers at home.

The collection of data for this study employed the techniques of content analysis, one form of qualitative research methodology, which reveals descriptive data. The researcher was the primary instrument for collecting data. The commercial reading software designed for Pre-K through third grade children were selected and analyzed. The analysis was done inductively. The researcher viewed the sample software and transcribed the content into text. The next step was categorizing the data and interpreting the meaning of the results of the data to answer the research questions.

This chapter presents the findings emerging from the analysis and will be addressed in five sections according to the questions of the study. The first section provides the content found in the reading software. The second section provides instructional methods employed in the reading software designed for Pre-K through third grade children. The third section provides the reading models employed in the reading

software. The fourth section addresses the programming methodology used in the software. The last section provides the significant features utilized in the reading software to make the instruction more appealing for young children.

Findings

Question 1

What is the content of commercial reading software designed for Pre-K through third grade children?

From the analysis, five areas of content in reading intended for the children to learn and acquire reading skills through drilling exercises and enjoyable games emerged. The commercial reading software programs in this study contained the content categories of (a) alphabetic principle, (b) letter-sound association, (c) word knowledge, (d) sentence building, and (e) reading comprehension. The software presented content with basic literacy skills for preschool children and gradually developed more complex literacy skills toward higher-grade levels. However, although the reading software from different publishers contained the same five content areas of reading, the subskill emphasis varied based on the reading instructional approaches employed in each software programs.

Table 1 shows the presence or absence of the reading content areas and skills in the commercial reading software. It is obvious that the commercial reading software designed for Pre-K through third grade children focused primarily on the alphabetic principle, letter-sound association, and word knowledge. Sentence building and reading comprehension were also presented but were less emphasized than letter-sound association and word knowledge or vocabulary.

Table 1

Content Found in the Reading Software for Young Children

	Pre-K - 1st grade	2nd grade	3rd grade
1. ALPHABETIC PRINCIPLE			
Upper/lowercase letters	+	+	+
Letter names and sounds	+	+	+
Letter-word connection	+	+	+
Alphabetizing	+	+	+
2. LETTER-SOUND ASSOCIATION			
Consonants			
Single letter consonants	+	+	+
Blends and diagraphs	+	+	+
Silent letters	-	+	+
Hard/soft C and soft G	-	-	+
Vowels			
Single letter vowels	+	+	+
Vowel diagraphs	+	+	+
Silent vowels	-	+	+
R-controlled vowels	-	-	+
Final Y	-	-	+

(table continues)

Table 1 *(continued)*

Content Found in the Reading Software for Young Children

	Pre-K - 1st grade	2nd grade	3rd grade
3. WORD KNOWLEDGE			
Word recognition and identification	+	+	+
Sight words	+	+	+
Rhyming words	+	+	+
Spelling	+	+	+
Words and their meanings	+	+	+
Compound words	-	+	+
Words and their functions	-	+	+
Derivation of words	-	+	+
4. SENTENCE BUILDING			
Ordering simple sentences	+	+	+
5. READING COMPREHENSION			
Story reading	+	+	+
Story context clue	+	-	-
Answering questions about the stories	-	+	+

Note. Plus signs indicate the presence and minus signs indicate the absence of the content.

The findings in Table 1 also indicate the prominent trend of content development contained in the reading software programs. First, all software from Pre-K through third grade were loaded with knowledge of (a) alphabetic principle for the children to recognize letter names and sounds, upper and lowercase letters, letter-word connection, and alphabetizing, (b) letter-sound recognition of consonants, blends and diagraphs, (c) single letter vowels and vowel diagraphs, (d) word recognition and identification activities related to rhymes, spelling, sight words, and word meaning, (e) simple sentence building, and (f) story reading and comprehension.

The complexity of content in each area increased and new skills were added in higher grade levels. Namely, in letter-sound recognition, silent letters in words were learned in second grade, and learning of hard/soft C and G was presented in third grade. Similarly, compound words, word functions, and derivation of words were not found in Pre-K to first grade but were presented in second and third grades. Also, answering reading comprehension questions started in second grade, while Pre-K to first graders only practiced story context clues, which appear to be easier than answering questions about the stories read.

Alphabetic principle. All letters in the English alphabet were presented in all software. The learner can see upper and lowercase letters, hear their sounds, and view three to five key words that represent each letter. For example, the learner sees M, m, and hears the sound /m/, and sees words like milk, and moon, and a short poem constructed around words that illustrated the letter of the alphabet. However, the letters, Q, V, X, Y, and Z, were less focused in the software. It was also found that words children know were used in alphabetic principle lessons in second and third grade as shown in Table 2.

Table 2

Number of Letters and Words Used in Alphabetic Principle

	Pre-K - 1st grade	2nd grade	3rd grade
Letter recognition and identification			
Upper/lowercase letters	all letters	all letters	all letters
Letter-sound recognition			
Sound letters make	all letters	all letters	all letters
Key word for letter sounds	130 *	105 *	-
Alphabetizing			
Letters without word	all letters	-	-
Letters within words	-	90	135

Note. Asterisk signs indicate *non-text* words that the learners can only hear.

Letter-sound association. Obviously, from the analysis it was found that letter-sound association content was dominantly focused in all commercial reading software created for Pre-K through third grade children. All letters and their sounds were presented in words in a variety of exercises or drills. All practices emphasized solely how words are formed and sounded out. The major skills in letter-sound association determined by number of words used are as follows.

1) Single consonants. In the software, beginning and ending consonant sounds in short or three-letter words with the consonant-vowel-consonant (CVC) pattern, such as *bat, pen, sip, dog,* and *run,* were drilled in a variety of exercises. All software illustrated all letters that represent single consonants and their basic sounds in the English language.

Beginning consonants were more emphasized than ending ones in preschool and first grade. In second and third grade, more complex sounds, such as blends and diagraphs, were learned.

2) Blends and diagraphs. It was found that blends and diagraphs were as much emphasized as single letter-sounds presented in a variety of exercises. Words that begin with *bl, br, cl, cr, dr, fl, fr, gl, gr, pl, pr, scr, sk, sl, sm, sn, sp, st, sw, tr,* and *tw*, and end with *ld, mp, nd, ng, nk, nt, rd, sk*, and *st* were drilled without context or their meanings associated. Words that begin with the diagraphs *ch, sh, th,* and *wh* and end with *ch, sh, ng*, and *th* were also presented from preschool through third grade. However, it was found that blend and diagraph drilling was much emphasized in second grade.

3) Complex letter-sounds. From second to third grade, presentation of words that have silent letters, such as silent *k* in *knee*, *w* in *wrong*, and *h* in *ghost*, was found. Also, more complex sounds, such as *ph* for */f/* in *phone*, hard and soft C, such as *coat* and *cell*, and hard and soft G in *give* and *energy* were found. Complex ending sounds such as *shy, guy, pie, key, fee, flea, you, too, to, new,* and *arc* were found, but in a small number of words and exercises.

4) Vowels. Vowels were also a central focus. Single letters - *a, e, i, o*, and *u* - that represent short and long vowels, vowel diagraphs, and complex vowels were drilled in a large number of words and in a variety of exercises without context and meaning association. In preschool through second grade, single-letter vowels, short and long vowels, and vowel diagraphs were the major focus. In second grade and third grade, more words with vowel diagraphs, and complex vowels were learned.

Table 3

Numbers of Words Found in Letter-sound Association Practice

	Pre-K - 1st grade	2nd grade	3rd grade
Consonants, blends and diagraphs			
Beginning consonants	110 - 150	50 - 95	50 - 64
Ending consonants	85 - 125	50 - 75	50 - 55
Beginning blends and diagraphs	20 - 85	180 - 225	37 - 97
Ending blends and diagraphs	10 - 15	90 - 134	38 - 90
Complex sounds			
Silent letters	-	10-16	35 - 41
Complex beginning sounds	-	50 - 55	-
Complex ending sounds	-	35 - 42	-
Hard/soft C	-	-	16 - 20
Hard/soft G	-	-	7 - 18
Vowels			
Short vowels	100 - 202	100 - 135	35 - 43
Long vowels	78 - 107	100 -135	28 - 41
Vowel diagraphs	45 - 93	95 - 113	75 - 90
R-controlled vowels	-	-	18 - 24
Final Y	-	-	35 - 48

Word knowledge. In this study, it was found that the commercial reading software programs contained many drill and practice exercises on word recognition and identification from Pre-K through third grade as shown in Table 4.

1) Word recognition and identification. In word recognition and identification practice, all software attempted to have learners recognize and identify words according to their spelling and pronunciation without context. From preschool through third grade, a large number of words were drilled in a variety of exercises, such as recognizing and identifying sight words and rhyming words. In third grade words that have the same pronunciation but spelled differently (homophones), such as *to, two*, and *too*, and syllables of words were identified.

2) Words and their functions. It was found that in the reading software programs from second grade to third grade the presentation of word knowledge gradually added knowledge about complication of words in terms of functions, such as nouns, verbs, adjectives, adverbs, and prepositions. Content words as well as function words were recognized and identified in isolation without context exercises.

3) Words and their meanings. According to the analysis, it was found that drilling and practicing on identifying words by their meanings began in preschool years. The learners were asked to categorize the given words into groups, such as house things, play things, animals, travel, people, and containers. In second and third grade, matching synonyms, antonyms, homonyms, and opposite words were presented. Derivations of words and their meanings, namely suffixes and prefixes, were also one of the word recognition exercises in second and third grade. Apparently, doing exercises on word recognition and identification by their meanings was dependent solely upon the learners'

past knowledge about words, rather than getting the meanings of the words in the software. All of the exercises attempting to focus on identifying words by their meanings were done without context.

4) Word building. Spelling was one of the major focuses in the reading software. The learners were shown and asked to spell a large number of words drilled in a variety of activities. Learning how to build compound words and contractions started in second grade, while learning about abbreviations and capitalization was presented in third grade.

Table 4

Number of Words Found in Word Knowledge Practice

	Pre-K - 1st grade	2nd grade	3rd grade
Word recognition and identification			
Sight words	100 - 235	124 - 185	115 - 205
Rhyming words	85 - 170	120 - 184	168 - 195
Homophones	-	-	84 - 168
Syllable identification	-	-	73 - 95
Words and their functions			
Function words	15 - 40	25 - 45	18 - 35
Content words	35 - 68	56 - 92	45 – 95
Nouns	-	55 - 90	61 - 108
Verbs	-	55 - 82	80 – 108
Adjectives	-	40 - 90	60 - 108

(table continues)

Table 4 *(continued)*

Number of Words Found in Practice of Word Knowledge

	Pre-K - 1st grade	2nd grade	3rd grade
Pronouns	-	15 – 24	25 – 37
Prepositions	-	15 – 23*	24 – 36*
Adverbs	-	-	60 - 108
Words and their meanings			
Word grouping	100 - 125	85 - 132	64 - 145
Synonyms	-	68 - 180	72 - 146
Antonyms	-	68 - 180	72 - 168
Homonyms	-	76**	48**
Opposite words	-	66**	-
Suffixes	-	34 - 98	59 - 70
Prefixes	-	-	35 - 78
Word building			
Spelling	140 - 180	228 – 280	198 - 304
Compound words	-	25 - 90	60 - 105
Contractions	-	20 - 33	25 - 35
Abbreviations	-	-	36 - 88
Capitalizations	-	-	22 - 87

Note. The single-asterisk signs indicate *non-text* words. The double-asterisk signs indicate words found in only one software.

Sentence building. From Pre-K through third grade, it was found that all reading software contained exercises that practice building sentences by having the learners reorder the given words and punctuation marks into simple sentences. These exercises start with three-word sentences in Pre-K to first grade. The sentences gradually get longer up to nine words in second and third grades. In third grade, sentence building was more complicated with different punctuation marks, such as question, quotation, and exclamation marks. All sentence building exercises were drilled without context. Below are examples of sentences used in sentence building exercises in the software.

Pre-K to1st grade

I am happy.
I like dogs.
I like to read.
She can sing.
My toy is red.
He likes my family.

Second grade

Is Sam with Pat?
My mom is home.
The cat is sleeping.
Can you come play?
I fell down on the ice!
My yellow shirt ripped.
Jim will go to the zoo with Tim.
She is happy because her dog came back.

Third grade

I rode my bike today.
Watch out for the car!
Will you play with me?
What time do you go to sleep?
We won every game this year!
When I am cold, I wear a jacket.
The sign said, “Keep off the grass.”
Use the washcloth to clean your face.
Cows, horses and pigs live on the farm.
Tomorrow, I will make a cherry pie for you.

Story reading and comprehension. From the analysis, it was found that all commercial reading software contained stories for reading practice, both in non-book and storybook formats. Number of stories, story length, and number of questions asked about the stories varied among software depending on the software developers.

1) Storybooks. Storybooks in the commercial reading software for young children came in illustrated storybooks that help children develop visual and auditory word recognition and acquire sight-word vocabulary. Children could read the stories on their own or hear the stories read and dramatized by a cast of cartoon characters, especially in the software created for Pre-K to first grade children. Storybooks were written with a carefully selected set of easy-to-read words, or decodable words. Each story consisted of short sentences which gradually got longer and more challenging as children built their reading vocabularies. Accompanying illustrations were animated and tied to the text to aid comprehension as well as to make reading fun. In addition, children can get help reading by clicking on individual words and sentences to hear them read aloud.

The reading software publishers have developed their own specific storybook patterns, such as illustrations, scenic settings, number of pages, characters, vocabulary, story themes, and interactive activities. The reading software developed by different publishers offered different number of storybooks to read. Some publishers offered 30 to 64 storybooks, while other publishers offered 8 to 25 storybooks in their software, especially the software that emphasized phonics skill-based drill and practice. Most of the storybooks contained easy vocabulary and rhyming words learned from skill-based exercises in the software. Also, most of the story themes were developed around everyday activities in child life. Most storybooks came in a series with certain patterns,

such as settings, characters, color schemes, and number of pages, depending on the software publishers. Below are some examples of stories found in the storybooks.

The Mask (The Learning Company, 1999)
Look at Mit. Look at this mask.
See the mask on me.
Now I am Sam. See the mask, Sis.
Is that Sam?
I am Sam. See me. See me.
No! I am Sam. That is Mit.
I am mad. That is a mask.
Sam is mad at Mit.
Mit is mad. Now the mask is on Sam.
That is Sam.

Little Ben (Knowledge Adventure, 1999)
Little Ben needs a nap.
He can nap in a hat.
He can nap in a nut.
He can nap in the sun.
He can nap in a can.
He can nap in a cup.
Ben can nap in a tub.
Oh, no! Ben is all wet. He needs some sun!
The End

UnDay (Knowledge Adventure, 1999)

Baby Boogi puts down her suitcase. "I had a great time at Granny Boogie's house, but it feels good to be home. I wonder what day it is today," she says to herself. Boogie looks at the calendar. She says, "Oh today is Unday. I guess I will Unpack my suitcase."

"I need to use the key," says Baby Boogie. "This key will Unlock my suitcase." When she opens the suitcase, she hopes to see her gift from Granny Boogie. But all she sees is her blanket. She says, "I will Uncover the things in my suitcase."

Under her blanket she finds her jacket and hang it in the closet," she says. But still she does not find her gift. Under her jacket, she finds her shoes tied together. "I will Untie the shoelaces and put my shoes away," she says. But still she does not find her gift. Under her shoes, she finds some toys. "I will Unload these toys and maybe then I will find my gift," she says. And she finds her gift in the bottom of the suitcase. Now I will Unwrap my gift," she says. Inside, she finds a new calendar and puts up the new one. "Oh, look! It's not Unday. It's Sunday. I guess I will go play in the sun.

The End

2) Non-book stories. The stories that came in non-book format were usually short and did not have illustrations to guide comprehension. Thirty non-text stories were told for fun in the software for Pre-K to first grade children. In second grade and third grade, the stories were read aloud to the learners and followed by two questions about the story to answer. The same story was reused to ask another one or two questions. Below are the examples of non-book stories found in the software published by Knowledge Adventure (1998, 1999).

> Timmy the Turtle (non-text story, Pre-K to 1st grade)
> Timmy the turtle lived in a glass tank. More than anything, he wanted to get out and see the world. One day he clawed up to his glass, and saw two big green eyes – a cat! Now, more than anything, Timmy the turtle wanted to stay in his tank.
>
> The Bee in the Car (Pre-K to 1st grade)
> There's a lid on the jar in the car.
> There's a bee in the jam in the jar.
> The lid comes off. The bee flies out.
> Watch us run around and shout.
>
> Funny Things (2nd grade)
> I like to think of funny things.
> A cat with wings or a mouse that sings.
> An elephant balances a pickle on his nose.
> He's even funnier with balloons on his toes!
> Purple penguins pilot planes.
> And an orange octopus laughs when it rains.
> Imagine a gorilla skating on a rink.
> She twirls around in a skirt that is pink.
> It's all in my head with those other things.
>
> The Beginning of Fire (3rd grade)
> This is a story about how we got fire. In the beginning of time only Crocodile Man had the fire. He was selfish about it and kept it all to himself. Nearby was Bird Woman who wanted the fire too. With no fire, she was always in the dark and cold. One night Crocodile Man fell into a deep asleep. Bird Woman saw her chance to get the fire from him. She flew dawn and grabbed the fire sticks out of his mouth. Then she put them in her tail and became a beautiful rainbow bird. Everywhere she landed she put fire into the heart of every tree. Then everyone was able to share the fire from the dry logs. From that day on, no one was in the dark or cold again.

3) Comprehension. From the analysis, it was found that the comprehension practice, both non-book stories and storybooks, in second and third grade was to read stories and answer multiple-choice questions about the stories. Apparently, most questions were questions that asked for details of the stories. WH-questions - who, what, where, when, why - were basically asked, and the correct answers to the questions were literally easy to find in the story. In third grade, however, questions that asked how and why things happened were also used to practice deduction skill in reading. Following are some examples of questions asked in the software.

Spaceship Dream (second grade, Knowledge Adventure, 1997)

What did one of the aliens look like?
- He was purple and pointy
- He was orange and red stripped.
- He was yellow and round.
- He was blue and green dots.

Where did the dreamer found himself?
- He found himself at school.
- He found himself in a TV show.
- He found himself at the mall.
- He found himself in a spaceship.

Why were the aliens coming closer to the dreamer?
- They wanted him to watch TV with him.
- They wanted him to fly their spaceship.
- They wanted him to play ball with him.
- They wanted him to talk with him.

The Camp Out (third grade, Knowledge Adventure, 2000)

Where does the family like to go camping?
- A. in the mountain
- B. in the country
- C. in the valley

What kind of trees do they find?
- A. pine
- B. oak
- C. maple

How do they cook their meals?

A. over a fire
B. on a stove
C. in the oven

Multiple-choice questions for comprehension practice were not found in the software, from Pre-K through third grade, that offered a series of storybooks, 30 to 64 storybooks, in their software. However the software that offered storybook series practiced comprehension skill by using context-clue exercises.

4) Story context clue. Story context clue was another comprehension exercise found in the reading software designed for Pre-K to first grade children. In the story context clue exercises, children were asked to select the right words to fill in the blanks in sentences to complete a story. Therefore, the learner had to understand the story and know the meaning of words given, as well as the sentences, in order to complete the story correctly. However, the stories were very short and words used seemed easy because some rhymed with words in the story and picture clues were provided. Some examples of the story context clue found in the software are as follows.

The Frog on the Log (Knowledge Adventure, 1999).

Down by the bog sat a frog on a _____.	rat	log	cry
Up to the frog ran a bug with a _____.	jug	gray	oar
"Bug, do you think I may have a _____?"	drink	shore	clam
"How can you do when you have no _____?"	mug	sea	moon

The New Friends (Knowledge Adventure, 1999)

There once was a _____ who wanted to fly.	ham	leaf	cow
To sail through clouds across the _____.	sky	flag	hen
One sunny day a _____ flew by.	bird	lamp	fork
He wished to _____. I can't say why.	doll	door	moo
"Let's be _____," he said. "Don't cry."	friends	kiss	arm
"For you can ____ and I can fly."	moo	violin	wagon

Pick the word that completes the sentence by looking at the picture clue given. (The Learning Company, 1999)

1. Look at this _____.	book	hole	it
2. Sam is in the _____.	book	hole	meet
3. Mat is mad at _____.	look	meet	Sam
4. Look at this _____.	raft	snowman	fell
5. Sid sees the _____.	mad	fort	apple

5) Ordering simple stories. Given three short sentences, the second graders were asked to arrange the sentences in the correct order to make a sound story. The learner had to understand the meaning of the sentences and look for key words to order them into a story correctly. Therefore, ordering given sentences into stories was one of the comprehension practices offered in the commercial reading software. The sentences used were very simple. Most of the stories to be built were developed around children's everyday experiences. This would be an easy task for them to make stories if they could read the sentences aloud and get the meaning of the given sentences. Below are some examples of exercises found in the reading software (Knowledge Adventure, 1999).

Given sentences	Complete Stories
Sam gets in line second. Pam gets in line first. Ted gets in line third.	Pam gets in line first. Sam gets inline second Ted gets in line third.
Now Benny's glasses are broken. He sits down and hears a crack! Benny cannot find his glasses.	Benny cannot find his glasses. He sits down and hears a crack! Now Benny's glasses are broken.
Blow out the candles! Here comes the birthday cake. Make a wish while the candles are lit.	Here comes the birthday cake. Make a wish while the candles are lit. Blow out the candles!

Table 5 shows that all commercial reading software offered stories for reading and asked multiple-choice questions about the stories for comprehension practice. In addition, some software in certain grade levels offered practices of story context clue and

ordering sentences into stories. It was found that the number of stories, story length, and number of questions asked were gradually increased as grade levels got higher. Pre-K to first grade children would only enjoy reading stories, but second and third grade children were asked questions about the stories they read.

Table 5

Number of Stories, Questions Asked, and Length of the Stories

	Pre-K - 1st grade	2nd grade	3rd grade
Storybooks	8 - 64	15 - 30	25 - 40
Length in words	50 -150	260 - 370	240 - 450
Multiple-choice questions	-	60**	175**
Non-book stories	30*, **	9**	9**
Length in words	45 - 55	40 – 80	40 - 135
Multiple-choice questions	-	36	54
Story context clue	5 – 12**	-	-
Words to complete stories	20 – 60**	-	-
Ordering simple stories	-	30**	-

Note. The single-asterisk sign indicates the number of *non-text* stories. The double-asterisk signs indicate the content found in only one software.

In summary, it was found that the content offered in the commercial reading software designed for Pre-K through third grade children was focused on five major learning tasks in early reading; (a) alphabetic principle, (b) letter-sound association, (c) word knowledge, namely word building, word recognition and identification, (d)

sentence building, and (e) reading and comprehension. All reading software program presented these learning tasks by utilizing game strategies, and multimedia features, such as animated cartoon characters, fantasy scenarios, and sound. For example, in learning letter-sound association, word recognition, and story reading, computerized multimedia technology allowed the learner to see the text, hear the sound, and enjoy animated graphics simultaneously while learning on the reading software. However, from the analysis of the reading software, it was found that different publishers employed certain reading approaches in designing and presenting the content in their software. In the next section, characteristics of the reading approaches found are elaborated.

Question 2

What are the instructional methods employed in the reading software commercially available for Pre-K through third grade children?

Based on the observation and analysis, it appeared that the commercial reading software programs emphasized instruction of phonics and utilized instructional methods of direct instruction, associative learning, and mastery learning. These instructional methods were relatively applied in the software. Despite the controversy between the two reading perspectives, the terms “phonics” and “whole language” were used by the reading software publishers to promote their software. For example, the word “phonics” was used in some software titles as well as reading skills that would be learned by phonics-oriented instruction presented in the software. Some publishers provided statements of how their whole language-based software would potentially benefit Pre-K through third grade children learning to read. Despite the fact that the software publishers used the terms “phonics” and “whole language” to promote their reading software

programs, it was found that different publishers of the commercial reading software for Pre-K through third grade children employed only phonics perspectives in developing the software, but different publishers presented the content (e.g., lessons, exercises, story reading and comprehension activities) in different ways.

Phonics instruction. From the analysis, it was found that the commercial reading software designed for Pre-K through third grade children employed phonics-based instruction that is concerned with teaching basic reading skills that emphasize letter-sound association and pronunciation of words. According to Adams (1990) phonics is defined as "a system of teaching reading that builds on the alphabetic principle, a system of which a central component is the teaching of correspondences between letters or groups of letters and their pronunciations" (p. 50). From Pre-K to third grade, all software offered drills and practices that were heavily focused on the alphabetic principle, letter-sound association, and word knowledge or vocabulary that mainly emphasized word building and pronunciation of words through a variety of isolated skills lessons. Presentation of word meanings was usually left off in doing the exercises.

Story reading and reading comprehension exercises were not excluded in the phonic-based reading software, but they were less emphasized and presented in different ways by different publishers.

Direct instruction method. According to Willis, Stephens, and Matthew (1996), educational software that concentrate on skills and drill are created under a direct instruction method. In direct instruction, an objective is selected to be reached, the stage is set for learning, the skill is explained or modeled, guided and independent practice are provided, and the students are evaluated and re-taught as indicated. Similarly, in this

content analysis study it was found that the commercial reading software utilized the strategy of direct instruction. Direct instruction method is comprised of some steps found in the software.

1) The target skills were identified.

2) Orally, the skill was explained and guided with models or examples.

3) Independent practice of the skill was given in a set of exercises and the progress was monitored simultaneously.

4) Direct response or feedback was provided.

From the study, it was found that the commercial reading software programs provided responses that enable the individual to learn the lessons at his or her own pace, sequence, needs, and learning styles. According to Alessi and Trollip (1991), response is crucial for the reinforcement of learning. The essential responses found in drill and practice exercises in the reading software were responses that directly guided the learner to the correct answers and anticipated several incorrect answers.

The direct-guided response found in the software followed the same pattern. That is, when the wrong answer or choice was selected, the choice remained inactive, changed its color, disappeared, or was replaced by a new choice. At the same time, the verbal responses, such as “Try again,” “That’s not right,” and “Not that one,” were also provided to prompt the learner to find the correct answer. However, none of the reading software programs provided a response that explained why the answers were correct or incorrect. Any time the correct answer was chosen, responses, such as “That’s right,” “Right on the spot,” or “Well done,” were provided before moving on. In short, the

responses found in drill and practice exercises in the reading software for young children were Yes-No responses.

5) The learner's level of achievement on the tasks was evaluated and then the program moved on to the next skill (or next level of the same skill) or repeated the skill or exercise until the achievement met the criteria pre-set in the program.

6) An automatic tutor mode was provided to clarify understanding of what and how to do in order to assist the learner to achieve on the task. Most software also allowed manual access to the tutor mode when the learner needed help. In the tutor mode, the program read aloud the textual explanation to the learner. However, in terms of instruction the explanation was short and might not be sufficient enough for the learner to gain knowledge or understanding of what he or she was doing or learning. Below are some examples of the explanation found in the tutor mode.

> Vowels
> *Short Vowels*:
> Vowels make short sounds and long sounds. A short vowel sound is like a vowel's nickname. For example, the short sound of *A* is *a* like in *apple*. *Cup* has the short *u* sound. *Fed* has the short *e* sound." (Knowledge Adventure, 1999)
>
> *Long Vowels:*
> When a vowel makes a long sound it says its full name. The long sound of *A* is *a* like in *ape*. *Cute* has the long *u* sound. *Five* has the long *i* sound. (Knowledge Adventure, 1999)
>
> Comprehension
> A good strategy would be to read all the possible answers again, think about which ones don't make sense and rule out the wrong answers. (Knowledge Adventure, 1999)
>
> The ball is *red*.
> What *color* is the ball?
>
> To help you choose the correct answer, look for key words in the question, like the example on the left. (Knowledge Adventure, 1999)

Phonics instruction benefits most from direct teaching that is systematic (Smith, 2000). The commercial reading software that taught phonics employed a skills-based direct instruction approach, usually out-of-context instruction in which a skill was taught in isolation. They separated the phonics lessons from the act of reading and taught phonics skills in isolation until these skills were mastered. There were few exercises that helped the learner apply his or her phonics skills to the story reading practice.

Associative learning. One of the prominent learning methods found in the commercial reading software designed for young children was the associative learning method. There were two obvious features related to associative learning employed in the software: oral language and language experience association and word family presentation.

1) Oral language and language experience association. In all commercial reading software from Pre-K to third grade, it was found that only oral language was used for giving directions. This might be because children cannot read yet. Based on the underlying assumption that children will learn to read better if much of the instruction is anchored around stories from their own experiences and involves words from their spoken vocabulary, similar to a language experience approach, most reading software programs used concrete and easy words and stories children already know in most exercises or lessons. From the analysis of the story themes presented in the software, it was found that most of the story themes, 34.33%, were developed around children's experience, especially in the software for Pre-K to first grade children. Also, activities and things in everyday life, such as fun play, animals and pets, and family and friends, were used. Story themes about imagination that were more complex to comprehend were

used for older children in second and third grades. Tales were not found in Pre-K to first grade software, but tales were used in second to third grade as the data shown in Table 6.

Table 6

Percentage of Story Themes Found in the Commercial Reading Software

	Pre-K - 1st grade	2nd grade	3rd grade
Things around children	34.33	10.94	12.50
Animals and pets	21.82	12.50	14.06
Fun play	20.11	25.00	18.75
Family and friends	16.50	18.75	17.19
Imagination	7.24	20.31	20.31
Tales	0	12.50	17.19

2) Word family. Use of word family, or pattern, was the common practice in the instruction of skill-based exercises found in the reading software. This was especially true in a phonics emphasis program that taught children to recognize letters and their sounds, and then sound out the letters and the targeted words. The learner was shown that the sounds of the initial or final letters were differentiated among the words in each family. Therefore, the learner learned a discrete part of the word rather than see the word as a whole. For example, a child learned *pen, Ben,* and *men* by seeing that the letter-sounds *p, b,* and *m* are differentiated in the *–en* word family. Word families were also used in a variety of exercises, such as word rhymes, compound words, words and their functions, and homophones. Below are some examples of word family learning strategy.

Word building	Word rhyme	Compound words
p + en - pen	hide - ride	butter + fly - butterfly
b + en - Ben	ride - side	dragon + fly - dragonfly
m + en - men	side - tide	butter + cup - buttercup

It was also found that certain activities that support associative learning and word family strategies were used in the reading software designed for young children, namely, yes-no selection, multiple-choice selection, matching, sorting, grouping, and arranging. For example, in an exercise the learner was asked to listen and match sounds to letters or letter combinations, such as consonant blends and diagraphs. In a grouping activity, the learner was asked to group the given words according to the letter sounds, or meaning, such as words that begin with /t/, or words that are animals and pets. Table 7 shows that all reading software utilized matching and multiple-choice selection activities. Matching activity was mainly used in the letter-sound association exercises and multiple-choice selection was usually used in word knowledge and comprehension exercises.

Table 7

Number in Percentage of Associative Activities in Drill and Practice Exercises

	Pre-K – 1st Grade	2nd Grade	3rd Grade
Yes-or-No selection	3.33	0	0
Matching	36.66	43.33	36.67
Multiple-choice selection	40.00	16.67	33.33
Sorting	6.67	13.33	6.67
Grouping	6.67	10.00	10.00
Arranging	6.67	16.67	13.33

Mastery learning. The basic idea behind mastery learning is to make sure that all or almost all students have learned a particular skill to a pre-established level of mastery before moving on to the next skill (Slavin, 1988). It was found that the commercial reading software designed for preschool through third grade children were built on this idea. Also, in mastery learning it is expected that almost every student can learn the skills presented in the software. It appears that there are three major distinguishing characteristics of mastery learning utilized in the commercial reading software: mastery criteria, levels of difficulty, and progress monitoring.

1) Mastery criteria. Almost all software established hidden scores or criteria to indicate mastery of a given exercise. The mastery criteria found in the reading software were typically set somewhere between 80 and 95 percent correct. In some software, the mastery criterion was set at 100 percent correct for skills that are essential, such as identifying letters and their sounds, especially in the programs created for preschool to first grade children. The software programs evaluated how much the learner achieved in each round of doing an activity. If the learner did not do the exercise correctly to meet the mastery criterion, the programs usually repeated the activity until the criterion was met before it moved on to the next activity or skill. The mastery criteria in different individual skills were found independent of one another.

2) Levels of difficulty. Some learners will achieve the mastery criterion on certain skill-based exercises that are easy for them, while other students may struggle on those exercises. It was found that all reading software established levels of difficulty in skill drillings to serve individual differences. It appears that the levels of difficulty found varied among the software programs. However, they can be determined by two

characteristics: (a) length and complexity of words, sentences, and stories, (b) major skills and sub-skills or related skills. For example, in word function skill, nouns, verbs, adjectives, and adverbs were presented in different levels of difficulty regardless of length and complexity of the words used in exercises. In short, difficulty leveling in the commercial reading software for young children was not the serious issue. This may indicate that the reading software programs encouraged children to master reading skills intended for children to learn.

3) Progress monitoring. Every reading software for young children provided progress monitoring known as *progress report* for the learner to track his or her own mastery level. Typically, the progress report consisted of a skill list in the program and a record of the learner's progress presented in percentage of achievement in each skill. The progress report was important because it could be used for self-evaluation.

In summary, the findings show that the commercial reading software designed for Pre-K through third grade children employed phonics approach. Software that was developed on phonics perspectives emphasized skill-based practice on letter-sound association and word knowledge. Although story reading and comprehension activities were offered, they were less emphasized. To support phonics instruction, all commercial reading software programs applied the instructional methods of direct instruction, associative learning, and mastery learning.

Question 3

What are the reading models employed in the reading software?

From the analysis, it was found that the role of phonics and skill-based drill and practice and direct instruction approaches dominated designs of reading software.

The approaches employed in the software programs revealed the reading model. A reading model is a graphic attempt to depict how an individual perceives a word, processes a clause and sentence, and eventually comprehends a text. Generally, there are three reading models.

Top-down is the model that emphasizes learning to read in meaningful context. Background knowledge and prior experience of the learner are central to successful reading. Comprehension is built on the learner's prior knowledge and experience. Practice of skills comes after reading the whole text. In short, the top-down model proceeds from whole to part. Whole language perspectives and instruction are based on the top-down model. On the other hand, bottom-up proceeds from part to whole. This reading model emphasizes the written or printed text. Comprehension begins by processing the smallest linguistic unit (phoneme), and working toward larger units, such as syllables, words, phrases, and sentences. Learning basic reading skills is the priority. Phonics software programs are built on the bottom-up model. Interactive model recognizes the interaction of bottom-up and top-down processes simultaneously throughout the reading process.

Based on classification of three reading models above, it was found that the commercially reading software designed for Pre-K through third grade children applied only bottom-up reading model. All software offered a number of skill-based exercises that attempt to have children learn basic reading skills, such as alphabetic principle, letter-sound association, word knowledge. The basic reading skills in the software were a part of reading for a child to use for comprehension of a text or story read. Reading comprehension exercises were also provided in the software for children to practice.

However, it was found that there were two types of presentation model applied by different publishers, skill-based random access and storybook-based serial access. In the skill-based random access model, the software programs allowed randomly access to any skill the learner wanted to practice and learn. Reading the story and comprehension were a part of skill practice as shown in Figure 1.

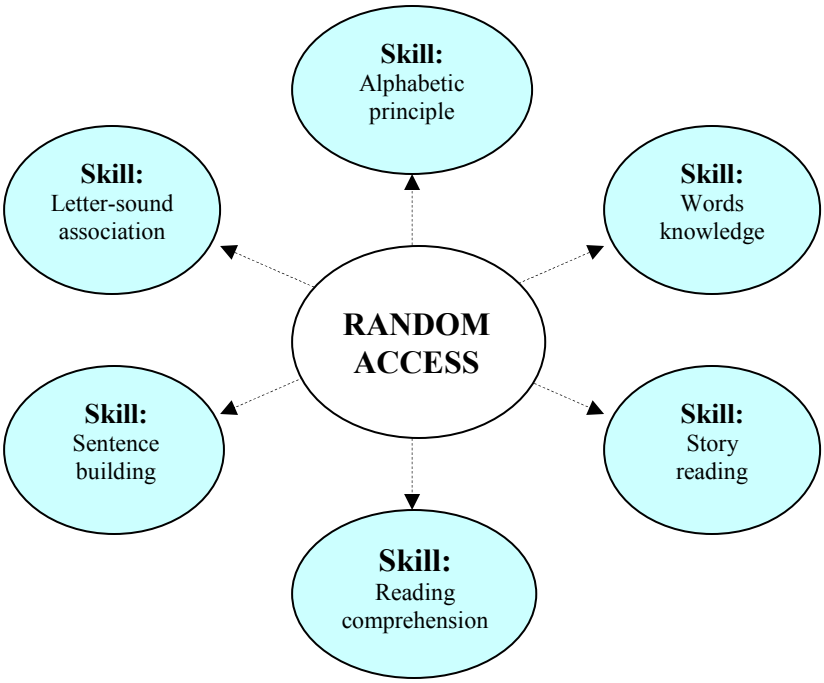

Figure 1. The skill-based random access model used in the commercial reading software.

The reading software that emphasized storybook reading allowed a serial access to practice reading storybooks and also do skill-based exercises. Reading storybooks was the priority. The software programs that applied this type of model provided a series of readable storybooks. At the first time of signing in the program, reading storybooks was mandatory. The learner had to read two storybooks at a time and do phonics skill-based activities. Comprehension exercises were placed in between the book series.

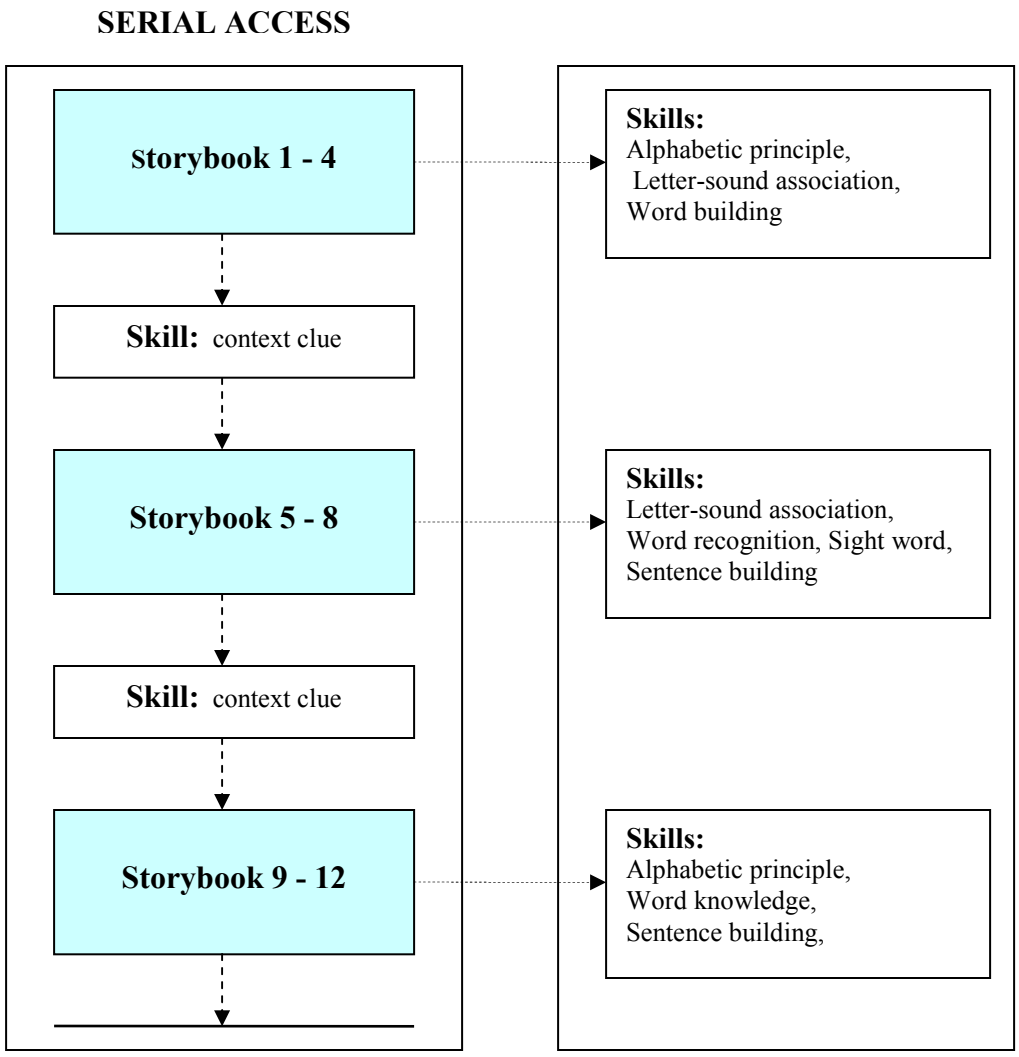

Figure 2. Storybook-based serial access model applied in the commercial reading software.

From Figure 2, a series of storybooks was arranged in a coherent sequence. Comprehension exercises were provided in the connection of storybook reading activities. The learner had to pass the comprehension exercise in order to move on to read the next storybooks and do more exercises. Phonics skill-based exercises could either be accessed inclusively in each story reading activity or exclusively and independently in the separate skill house section in the software.

Questions 4

What are the programming methodologies (e.g., tutorials, games, drill and practice, simulations, and tests) used in the reading software?

Findings

From the analysis, it was found that the commercial reading software designed for Pre-K through third grade children applied two methods in presenting the activities for the children to learn to read; drill and practice and learning game.

Drill and practice method. As mentioned in findings that answered question 2, drill and practice software provided a number of out-of-context skill-based exercises. All reading software programs that utilized drill and practice method provided immediate response or feedback to facilitate learning. Drill and practice method found in the software was used to support phonics instruction and was the most common type of computer-assisted instruction (CAI) found (Budoff, Thorman, & Gras, 1985). The drill and practice software employed four basic principles of programmed instruction: (a) the learning material is presented in small successive steps with explicit practice and testing of each step, (b) presentation of subsequent steps depends on the learner's response, (c) immediate response or feedback is provided to lead the learner to correct the errors, and (d) the learner proceeds at his own rate (Hefzallah, 1999).

Learning game. It was found that all of the reading software for Pre-K through third children in this study employed gaming strategies for instruction and learning. The gaming strategies used in the software programs consisted of collecting points or scores to achieve a goal or reward. Mastery of the target skills was a prerequisite to the winning of the game. Thus, as the learner played, he reinforced the skills he learned.

Game was the central strategy of presenting reading subject matters, such as alphabetic concept, letter-sound relationships, word spelling, word knowledge, story reading and comprehension. With the current advancement in computer technology, these drill and practice software made use of the multimedia capabilities using colorful graphics, animation, and audio clips, in playing a game that requires the mastery of subject-matters and skills. All games in the commercial reading software were utilized to make learning more enjoyable, fun, and exciting at the same time.

In the software programs, games were used to motivate, challenge, and engage the learner to stay longer in doing activities and learn the subject matter. From the analysis, it was found that the commercial reading software developers utilized certain gaming characteristics for Pre-K through third grade children. The gaming characteristics found can be designated into four categories: scenarios and settings, casting characters, playing strategies, and levels of difficulty.

1) Game scenarios and settings. All commercial reading software that used game strategies to motivate the learner set up a game scenario that required the learner to play a variety of games to accomplish the goal. Casting characters were also used to introduce the scenario, guide and encourage the learner to follow through the program. All software programs for Pre-K to first grade children presented simple game scenarios, such as camping, playing, and finding treasures. The software designed for older children, second and third grade children, used more complex and mysterious scenarios. The learner had to unfold the puzzle piece by piece to reach the ultimate goal, such as bringing back the lost person or finding the lost treasure. Game settings were actually set up accordingly to the scenarios. Realistic settings, such as playgrounds, places at home, and camping sites,

were used for younger children, while more imaginary and mysterious settings, such as outer space, underwater world, magical circus, historic and ancient cities, and underground mines were used for older children.

2) Casting characters. Animated cartoon characters, mostly animals, were used as casting characters in the commercial reading software designed for Pre-K through third grade children. Those cartoon animals, such as dog, cat, rabbit, bear, mouse, elephant, and lion, were children-like animals that can talk, play, and do activities. Few human cartoon characters were used.

3) Game-play strategies. Strategies of playing game are one of the important factors of motivation. It was found that game-play strategies used in the reading software programs were simple, namely racing, identifying objects, collecting things, and solving mazes or puzzles. All software programs required the learner to collect points (e.g., badges, jewels, keys, tickets) step by step while doing activities or playing the games. Racing strategy was rarely used in all grades. Identifying objects and collecting things (e.g., socks, fruit, turtles, honey) that contain letter, sound, and word parts were normally used. Solving mazes or puzzles were gradually used in the software for second and third grade children. It was also found that all reading software programs automatically save all data the learner has done and gained, so the learner could exit playing and come back to continue playing any time he or she desired.

4) Level of game difficulty. It was found that difficulty levels in the software were used for challenging the learner. By playing game, the learner gained rewards or points when he or she met the criterion. Points were accumulated as the learner continued playing games. Actually, collecting points to achieve the ultimate goal or finale of the

program was not linear. In other words, the learner could collect points from any game in the software. Basically, the gaming strategies used in the software were easy to play and achieve. That is, playing games was not the focus, the subject matters were. However, it was found that most difficulty levels of games were identical to the content or skill difficulty levels. In Table 8, the data shows that 40 to 70 percent of difficulty levels of games are changed by difficulty of content or skills.

Table 8

Gaming Characteristics Utilized in the Reading Software Presented in Percentage

	Pre-K–1st Grade	2nd Grade	3rd Grade
Game scenario settings			
Realistic settings	66.67	25.00	23.53
Imaginary settings	33.33	75.00	76.47
Casting cartoon characters			
Animals	66.67	75.00	76.47
Human beings	33.33	25.00	23.53
Game-play strategies			
Racing	6.66	0	0
Identifying things	53.34	56.25	41.18
Collecting things	33.33	31.25	29.41
Solving mazes or puzzles	6.67	12.50	29.41

(table continues)

Table 8 *(continued)*

Gaming Characteristics Utilized in the Reading Software Presented in Percentage

	Pre-K–1st Grade	2nd Grade	3rd Grade
Leveling game difficulty			
Change content or skills	66.67	56.25	41.18
Increase number of activities	20.00	25.00	23.53
Increase number of obstacles	6.66	6.25	23.53
Accelerate speed	6.66	12.50	11.76

In summary, drill and practice and game were the programming methods used in the commercial reading software designed for Pre-K through third grade children. It appears that certain publishers used the same programming method and style in their software series. Games were used to facilitate learning, hence the term *learning game*, because they were challenging and motivating for young learners to stay on skill-based drill and practice exercises. In addition, uses of animated cartoon characters, scenarios and settings, and a variety of game-play strategies made the presentation of the reading content more enjoyable and encouraged children to come back to play and learn.

Questions 5

What are the other features utilized in the reading software to make the instruction more appealing (e.g., graphics, animation, speech recognition, multimedia, and hypertext) for young children?

In addition to the findings of the content, instructional approaches, and programming methodologies, it was found that the commercial reading software created for young children contained some important features that made the instruction more appealing. Apparently, computerized multimedia technology plays an essential role in the software production. Designs and supports (e.g., manuals, extra printable workbook, internet websites access) are also important features that are appealing among commercial reading software.

Multimedia technology. Computer technology makes learning software programs more appealing than other materials in terms of instruction. Technology serves personalized or individualized learning because it provides audiovisual and interactive communication that other learning materials can not.

1) Graphics and animation. From the study, it was found that all commercial reading software for Pre-K through third grade children included similar features of animation, graphics, colors, sound, and music. Based on the study made by Fleming and Levie (1978) on uses of graphics and animation in learning software programs, it was found that uses of graphics and animation, as well as colors, sound effects, and music, to focus on the importance of information in a lesson in the reading software are consistent with and integrated into the instructional message. Besides using animated cartoon characters to cast and guide learning activities, uses of graphics, sound effects, and scenes were natural-like. Graphics were simple and most colors used were bright. Use of text sizes was appropriate for young children.

2) Speech recognition and record and playback. Few software programs published by certain companies had distinguished features of speech recognition and record and

playback to make their reading software more appealing. It was found that some reading the software utilized speech recognition technology. With a microphone connected to the computer, the learner could say or pronounce letters and words instead of point and click. Moreover, in the software that employed a whole language approach that required reading many storybooks provided record and playback function that allowed children to read, record, and playback their oral reading. Unfortunately, speech recognition and record and play back features were not found in the software designed for second and third grade children.

3) Songs. Presentation of songs in the reading software also made learning more enjoyable. However, it was found that few had songs to offer. Songs were offered in the software created for preschool to first grade children. From the analysis, songs can be categorized into two types: introductory song and instructional song. In most reading software, the introductory songs were presented at the beginning of the program after the learner signs in. The songs were persuasive and informative to encourage the learner to play and learn what the software offered. Instructional songs, on the other hand, were descriptive. That is, they contained instructional information that describes important content in the software, such as vowels, consonants, spelling, and rhyme. Songs that tell how reading is important were also included. Most instructional songs were presented as rewarding songs after the learner achieved certain levels or skills.

Designs. Designs also differentiated appeal among the commercial reading software for young children. It was found that all commercial reading software used similar designs of presentations.

1) Mode of presentations. Mode of presentation means whether information is presented to the student as text, graphics, sound, or a combination of these. It was found that text and speech were the most common way to present information. Graphics were used in the presentation of visual information that is not text. However, graphic presentations, including animation pictures, were used to enhance instruction in terms of motivation.

2) Length of presentations. It was found that the reading software used appropriate length of presentation, information, and activities depending on the subject matters and the age levels of the children. In younger grade levels, presentation is short to increase the frequency of student interaction. Apparently, the skill-based drill and practice methods employed in most commercial reading software break complex information or content into steps or sub skills and a variety of exercises to attract learner's attention and engagement.

3) Layout of text. Letters, words, sentences, and paragraphs in all software were well formatted. Sizes of text and spacing were designed effectively on the readability of text and also attractiveness. It was found that text sizes in younger grade levels were bigger than those used in older grade levels. Text that is being read or emphasized was usually highlighted with colors to catch the learner's attention.

4) Ease of use. It was found that all commercial reading software were easy to use. However, children need help when they are not familiar with new software. Frequently, students are naive in computer technology and quit using computer software because it is complicated and difficult to use or follow. Young children need to be taught

basic computer skills, such as use of keyboard, mouse, and how to navigate or use menus in the software, before they can work on the software independently.

5) Accessory programs. Different companies offered different accessory features to support content presentation and instruction, as well as to compete in marketing. It was found that some reading software offered emailing, drawing, and Internet access that allow children to enhance their learning and knowledge. However, most accessory features offered in most software were pre-programmed. That is, the learner could only generate things under the constraint. For example, the learner could only select words or phrases to complete the email messages given, rather than create his or her own message. Similarly, the learner could only select pictures and letters to create a picture in the software that offered drawing features. Furthermore, the Internet access offered in all reading software requires an Internet line connection and some certain software installation. Actually, although the reading software publisher's websites offered a lot of knowledge and entertainment, it needs higher reading and computer skills that many young children in Pre-K through third grade may not be ready and need help from adults.

Supports. All reading software had intention to provide supplementary supports to make the use of their software programs more effective. It was found that all software offered similar technical supports, such as manuals. Some publishers provided printable workbooks and storybooks offered their software. Yet, it is necessary to know how to find the document files and print them out. In short, children still need a lot of help from parents, teachers, or adults before they are familiar with using the program. In short, the commercial reading software had similar features although different publishers offered a little extra accessory to make their software more appealing.

Reliability

To test reliability, interrater, or agreement, reliability coefficients of Scott's interrater reliability formula (Wimmer, 1983) were used.

$$\text{Reliability} = \frac{\%\ \text{observed agreement} - \%\ \text{expected agreement}}{1 - \%\ \text{expected agreement}}$$

In this study, the six categories used for coding reliability test were alphabetic principle, letter-sound association, word building, word knowledge, reading comprehension, and other appealing features based on the content transcription draw from a software program. Each category consisted of coding units. The coding units in six categories were coded by two coders, the researcher and a doctoral student studying in the same program as the researcher, using the category coding system established for testing reliability. The distribution obtained from coding units in the six categories were as follows.

Category	Percent of all content
1 Letter-sound association	30%
2 Word building	20%
3 Word knowledge	20%
4 Reading comprehension	15%
5 Alphabetic principle	10%
6 Other appealing features	5%

The data obtained were calculated to determine the interrater reliability level. First, the percentage of expected agreement (the sum of the squared percentages of all

categories) was calculated, which was $(.3)^2 + (.2)^2 + (.2)^2 + (.15)^2 + (.1)^2 + (.05)^2 = .20$. From the coding test, the two coders agreed on 90% of their classifications (% observed agreement). Then, the interrater reliability calculation yielded the result of reliability equal to 0.875 as follows:

$$\text{Reliability} = \frac{.90 - .20}{1 - .20} = .875$$

Summary

The content analysis investigation of the commercial reading software designed for Pre-K through third grade children provided evidence that the commercial reading software emphasized phonics instruction. All software utilized skill-based drill and practice method supported by direct instruction and mastery learning methods and gaming strategies. It was found that the software offered and emphasized practicing out-of-context exercises. Phonics skills, such as alphabetic principle, letter-sound association, word building, and word knowledge were the main focus. Although different software publishers emphasized different types of presentation, skill-based and storybook-based, out-of-context drill-and-practice exercises were commonly found in all reading software programs. Also, the commercial reading software were developed on the perspectives that reading development is the continuum of oral language. To successfully use the software to assist developing reading skills, children need to bring their background knowledge and experience, especially meaning of words, to do the exercises offered in the reading software programs. Despite the fact that all commercial reading software publishers had well design and utilized multimedia technology to make their software more appealing, most of the features were used to support motivation in learning.

CHAPTER 5

DISSCUSION AND RECOMEMDATIONS

Overview of the Study

The review of history of computer-based instruction (CBI) in reading revealed that computer software used in the past were phonics-based and skill-and-drill oriented, which reflected the reading instruction in the 1960s – 1980s. Currently, the development of new reading theories and information has resulted in the development of different perspectives to reading instruction, especially for beginning readers, such as phonics and whole language. Also, the advancements in computer technology, such as multimedia, have evolved providing more powerful capabilities that can aid children in the learning process. Computer multimedia technology has powerful capabilities of presenting audio-visual and interactive communication. Learning to read by using the commercial reading software could be more effective than using other materials in terms of personalized or individualized learning.

Based on the assumption that advancements in computer technology and new reading instructional approaches can be applied to create educationally sound reading software program that presents pedagogically appropriate content to young children and utilizes appropriate instructional methodologies and unique features, this content analysis study was designed to determine what the commercial reading software offered for assisting development of Pre-K through third grade children's reading ability and how the effectiveness of the instruction provided. The results from this study will provide

recommendations for parents and teachers in choosing and using the commercial reading software beneficial for their children.

Ten commercial reading software programs designed for Pre-K through third grade children were selected to be analyzed. The data obtained from reviewing and transcribing the software were coded, categorized, and interpreted to answer five research questions which address the issues of (1) the content, (2) the instructional methods, (3) the reading models, (4) the programming methodologies, and (5) the other appealing features utilized in the commercial reading software programs.

Discussion of the Results

Based on the findings, important issues of the reading content, instructional methods, programming methods, and appealing features employed and utilized in the commercial reading software are discussed.

The Content Offered in the Commercial Reading Software

The instruction of phonics and word recognition

From the analysis, it was found that all commercial reading software offered skill-based drill and practice exercises that attempted to teach phonics skills, such as word building and word recognition skills through a variety of game activities.

Why the interest in phonics instruction? Heilman (1989) states that phonic skill is essential in beginning reading. The purpose of phonics instruction is to teach beginning readers that printed letters and letter-combinations represent speech sounds heard in words. Beginning readers need the phonics skills to blend a series of sounds dictated by the order in which particular letters occur in the print word to pronounce the printed word that is not instantly recognized. Phonics instruction teaches beginning readers the

concept that a printed word symbol represents the pronunciation of a particular word he or she uses and understands in oral language. "Phonics instruction is concerned with teaching letter-sound relationships" (Heilman, 1989, p.1), like most activities offered in the commercial reading software programs. Although some commercial reading software programs claimed to be developed basically on whole language perspectives by offering a series of storybooks in the software for children to read (The Learning Company, 1998, 1999, 2000), they did not provide activity that emphasized the meaning of the story read. Despite the fact that whole language perspectives were claimed, all commercial reading software programs in this study offered a variety of phonics skill-based drill and practice exercises to develop children's reading skills. These could be categorized into three major skills: alphabetic principle, letter-sound associations, and word knowledge. According to Metsala and Ehri (1998), the practice of these three skills presented in the commercial reading software programs is classified as *word recognition* skills that are essential for beginning readers.

The instruction of alphabetic principle

Presentation of the alphabetic principle was emphasized especially in the software for Pre-K to first grade children. Alphabetic principle refers to the concepts about "the twenty-six letters of the alphabet representing sounds of oral language and that all English words are composed of various combinations of the two" (Rigby, 1997 p.7 in Wilson, 1998). In learning the alphabetic principle from the commercial reading software programs, children heard letter sounds, words, and short poems or alliterations comprised of words that represented the letter and its sound. Most software presented letters in alphabetical order from A to Z in a separate activity, while some software that

emphasized reading a series of storybooks did not follow alphabetical order in its presentation of the letters. Storybook-oriented software presented the English letters in the order of S, M, H, T, F, D, W, B, R, C, Tr, N, G, P, K, Qu, V, L, Y, and Z. The letters A, E, I, O, and U, were presented in separate activities that taught vowel sounds. The letter X was left off for Pre-K to first grade children. The storybook-oriented software programs, which claimed to be whole language-based by the software publisher, presented the alphabetic principle as it would appear in the real text that children would see. For instance, letter Q always came with letter U as in, question, queen, and quit.

Overall, in the alphabetic principle practice, the commercial reading software programs attempted to present concepts about English letters through activities where the learners could view the letters (uppercase and lowercase), hear the letter sounds, and recognize and identify the letters in alphabetical order. Also, the software programs attempted to present the concept that the letters made up words.

The instruction of letter-sound associations

All commercial reading software offered content and skill-based activities that required children to dedicate their effort and time for learning letter-sound associations. The activities in the software basically dealt with *graphophonics*, and *orthography*. That is, children learned letters, or combinations of letters known as blends and diagraphs, and the sound each made. In the spelling system, children learned *onsets* – the initial consonant, consonant cluster, or anything before or up to the first vowel in a word, and *rimes* – vowel or vowel-plus-consonant element, as /h/ + /e/ in the word he, or /b/ + /at/ in the word bat. The rime can be referred to as anything after the onset, beginning with the first vowel.

By utilizing skill-based drill and practice exercises, all commercial reading software for Pre-K through third grade children emphasized recognition and identification of letters and sounds known as consonants, blends, diagraphs, short and long vowels, and vowel diagraphs. Determined by the number of words drilled in the software, Pre-K to first grade learned more single consonant sounds (110 -150 words with beginning sounds and 85 – 125 words with ending sounds) while in second grade children learned more consonant blends and diagraphs (180 – 255 words with beginning blends and diagraphs and 90 – 134 words with ending blends and diagraphs).

The findings also show that generally the more complex consonant sounds, vowel sounds, and words were introduced to older and more cognitively mature children. For example, words that have complex sounds, such as homophones (e.g., pail - pale, deer - dear), complex beginning sounds (e.g., ghost, hour, know, phone, write), and complex ending sounds (e.g., call, doubt, graph, cough, night, sleigh) were found in the software programs for second and third graders, while words that have R-controlled vowels (e.g., dirt, star, river, yard, garden) and words with final Y (e.g., buy, sky, dying, rhyme, any, baby, money) were found in the reading software for third graders only. However, all reading software programs offered a few words and exercises for children to practice complex sounds (e.g., 10 - 41 words for silent letters, 18 - 24 words for R-controlled vowels, and 35 - 48 words for final Y). This presentation practice that begins with simple exercises for young children in Pre-K and gradually gets more complex for older children in second and third grades is considered developmentally appropriate (Bruner, 1966; Piaget, 1970; Resnick & Weaver, 1979).

In practicing letter-sound association activities, all reading software programs in this study provided audio and visual features where the learners could hear sounds and view words simultaneously, but the software offered out-of-context exercises in which letter-sound associations were taught in isolation without meaning. In another words, the learners were assumed to know meaning of words used in the exercises presented in the software programs.

The instruction of word knowledge

In Pre-K to first grade, the commercial reading software programs emphasized word recognition instruction based on letter-sound association although some software programs introduced some exercises that practice the reorganizing and identifying function and content words by sight, as well as grouping words by their meanings. In second and third grade, the software shifted the focus from word recognition by letter and its sound to word knowledge instruction that emphasized word meaning. In second and third grade software programs, learners were provided with skill-based drill and practice exercises that emphasized recognizing and identifying words by their meaning (e.g., word grouping, synonyms, antonyms, homonyms, opposite words), words by their functions (e.g., nouns, pronouns, adjectives, verbs), and derivation of words (e.g., compound words, prefixes, and suffixes).

From Pre-K to third grade, there were six major skills taught in the reading software programs: sight words, rhyming words, function words, content words, word grouping skills, and word spelling skills. When determined by number of words presented in the software programs from Pre-K to third grade, there were 100 - 205 sight words, 100 - 145 words for grouping, and 140 - 304 words dealing with spelling. Among

these three skills, spelling was emphasized the most (140 - 304 words). Spelling skills are an indicator of pronunciations that are considered crucial for word decoding (Cunningham, 2000). Generally, most of the words used in spelling exercises were words that children know, the practice supported by Adams (1990). However, it was found that the reading software programs drilled words in isolation, rather than providing exercises that use words in meaningful contexts. Moreover, the meaning of the word was not given. The learners were assumed to know meaning of the given words. In other words, the learners were supposed to have learned words and their meanings from their past experience.

In summary, the commercial reading software programs designed for Pre-K through third grade children offered a variety of exercises that emphasized phonemic awareness, especially in the phonics-based software that explicitly provided skill-based exercises. Whole language-based software also emphasized phonemic awareness, but they attempted to assist children to acquire it through reading storybooks, especially in preschool to first grade, and practice fewer letter-sound association exercises.

Based on research findings, although word recognition skill is necessary for beginning readers (Metsala & Ehri, 1998), it is not sufficient for producing good readers. Word recognition skill-based out-of-context drill and practice cannot be given so much attention that other important aspects of a balanced literacy curriculum, such as word used in meaningful context, reading comprehension, and writing practice, are left out. The acquisition of word recognition occurs over time and develops gradually into more and more sophisticated levels of control over sounds. Research studies indicated that the reading development is achieved when there are both interactions with print and explicit

attention to meaningful activities. Also, reading abilities among very young children are related to home experiences and meaningful interaction with print. For good reading instruction that leads to success in learning to read, students are offered a print-rich environment within which to interact in language activities as readers and writers for real reasons in a variety of contexts (Anderson et al., 1985). The commercial reading software programs did not include environment that allows meaningful language activities that allow reading and writing for real reasons and contexts.

In response to the lack of meaningful activity in the software programs, it appears that the reading software programs provided features that allow communication among reading software users via the internet websites, such as Virtual Classroom (Knowledge Adventure, 2000) that allows the users to write emails to other users. However, it required the internet connection and particular computer application installations, which are additional and costly requirements for parents. Secondly, some reading software programs provided printable storybooks and supplementary exercises or worksheets, but they required adults' assistance, such as parents and teachers, in setting up a meaningful environment for the children.

The instruction of reading comprehension

In this study, it was found that the commercial reading software did not emphasize reading comprehension instruction. Although a number of storybooks were offered in some reading software programs, 30 – 64 storybooks by The Learning Company (1998, 1999, 2000), the storybooks were purposively used for practice reading that was based on decoding of words, rather than reading for meaning or comprehension practice.

To practice comprehension skills, the activities of context clue, ordering sentences to make a story, and answering multiple-choice questions about the story were used in the reading software programs, but these activities varied among the software. That is, context clue activities were found only in the software for Pre-K to first grade children, while ordering simple stories was found only in the software for second graders. Answering multiple-choice questions was found in the software for second and third grade children.

Most reading software programs offered practice of comprehension skills by using multiple-choice exercises, similar to a reading comprehension test. Despite the fact that the software programs provided explanation in the tutor mode, its short description was less helpful for the learners. Furthermore, the multiple-choice practices allowed guessing instead of independent thinking. The yes-no response type utilized in the software programs might direct the learner to the correct answer, but efficient explanation was needed to prevent trial and error learning that takes time and effort.

The Instructional Methods Employed in the Software

Phonics instruction

The commercial reading software for Pre-K through third grade children used in this study applied only phonics instructional perspectives despite that fact that whole language perspectives were claimed by some developers that reflected different models of content presentation and number of drill and practice exercises. The software programs that offered many decodable and predictable storybooks for children to read contained fewer skill-based exercises, such as letter-sound association, word recognition and

identification, and word building, than the software that emphasized skill and drill and offered fewer stories to read.

The findings from this study also revealed that the phonics-based software were related to a bottom-up reading model that proceeded from part to whole with learning basic reading skills as the priority. These programs assumed that reading comprehension required abilities to decode words in a reading text and to relate the sound of words to oral language. Meanings of words were drawn from the learner's past experience.

The benefits of the systematic instruction of phonics versus some other less direct forms of instruction such as whole language have long been debated. During the 1950s and 1960s, the language experience approach that emphasized teaching sight word recognition and suggested that sound/symbol recognition would occur on its own was used. Systematic phonics-skills-oriented practice reflected the reading instruction in the 1960s – 1980s. From the 1980s to 1990s, the whole language approach that attempts to blend language experiences and the use of phonics within meaningful context influenced reading instruction. Whole language requires that the instruction of phonics takes place when opportunities to point out phonetic connections come up while reading. In short, phonics instruction is intended to spontaneously occur in daily lessons and routines.

As time passed, it became apparent that some children who were instructed using a whole language method later encountered difficulties in reading (Schiller, 2001). Studies suggested that some children needed more formal instruction in phonemic awareness (Cunningham 2000, Hall, 1994, McGee & Richgels, 2000). It is this recognition that has moved educators to the current integrated or balanced instruction

approach that utilizes language experience, systematic teaching of phonics, and reading in meaningful context in teaching beginning readers.

Despite a balanced approach in teaching beginning readers, this study found that the commercial reading software programs emphasized phonics skill-based instruction in which practice of alphabetic principle, letter-sound association, and word recognition were the central focus. The reading software programs offered a number of separate skill-based exercises for the learner to practice and learn, but the software failed to present these skills in meaningful reading contexts.

Based on the study, Chall (1967, 1983) states that phonics may get children off to an earlier start in grasping letter-sound relationships and reading words than an approach that embeds phonics in a whole literacy context, such as storybook-based reading instruction, but the direct instruction and embedded phonics groups showed no significant differences in comprehension. Overall, there is little evidence that one form of phonics instruction is strongly superior to another in developing reading skills for beginning readers (Stahl, McKenna, & Pagnucco, 1994).

Direct instruction and mastery learning

Direct instruction

It was found that all commercial reading software programs employed direct instruction method to teach phonics. The reading software programs broke down the reading skills into component skills or subskills and practiced each skill directly in isolation without context as found in commercial educational software studied by Willis, Stephens, and Matthew (1996). Some experts believe that direct instruction is a very successful approach that deserves much wider use (Carnine, Silbert, & Kameenui, 1990;

Johnson & Pearson, 1975; Smith, Otto, & Hansen, 1978). Many educators today advocate whole language and balanced instruction that avoids the teaching of skills in isolation. However, Samuels (1988) posits that decoding the symbols of written English is a critical prerequisite for reading that is best learned from direct instruction and extended practice. In addition, research findings suggested that systematic direct instruction is superior for teaching phonics (Smith, 2000; Snider, 1990), vocabulary (Ed & Cockrum, 1985), and reading comprehension (Readence, 1986; Stevens, 1991). As a result, direct instruction has some value in teaching reading.

Mastery learning

Mastery learning method was also employed to support the direct instruction in the reading software programs. In doing skill-based exercises in the software, learners could master certain skills in a given time, help, and practice (Whitaker et al., 1989). The mastery level of achievement, or criteria, in practicing skills were pre-set. Practicing exercises would be automatically monitored, recorded, and saved by the program. If the learner failed to meet the mastery criteria, the program would repeat the exercise until the user achieved mastery before moving to the next exercise or level. The mastery learning criterion was determined by the ratio between the number of correct answers anticipated by the learner and the number of attempts made. Actually, the reading software programs set the mastery criteria very high in most exercises that emphasized separate skill-based practice. In short, the commercially reading software programs seriously expected the learner to learn what they offered by repeating doing exercises on particular skills until the learner reached the criteria of mastery.

Programming methods and appealing features

The combination of drill and practice and game

The findings from this study revealed that all commercial reading software programs employed drill and practice and game methods supported by direct instruction and mastery learning instructional methods. It is clear that the gaming method in the commercial reading software programs was utilized to motivate, engage, and challenge children to learn the reading skills offered in the software programs. In all reading software programs designed for Pre-K through third grade children, the gaming strategies used were not sophisticated but enjoyable and easy to accomplish with less effort and playing skills. In short, the commercial reading software utilized the gaming strategies appropriately to support the instructional methods employed. Despite the harmonious use of programming methods, there are concerns raised by critics that children lack creativity when drill and practice software are used (Haugland & Wright, 1997), and drill and practice-oriented software are usually a supplement to other instruction and are the most common type of CAI found (Budoff, T. Thorman, & A. Gras, 1985). Therefore, it could be concluded that the commercial reading software might be potentially beneficial when used as a supplemental material to other reading instructional methods.

The appealing features

In this study, multimedia technology was found to make the commercial reading software more appealing. The multimedia technology enabled the reading software programs to present graphic, text, and sound simultaneously, which is crucial for phonemic awareness acquisition that emphasized letter-sound associations. Also, animation technology, graphic designs, and use of cartoon characters made the software

more appealing to young children and encouraged them to engage in learning the reading skills. Other designs in game plays, such as mysterious and fantastic settings and plots, especially for older children, were also superb and encouraging. Even though some reading software programs provided features that allowed individual creativity, such as drawing and emailing, those features were used more for enjoyment rather than learning enhancement. In this study, writing activities were not found in all reading software programs.

Overall, the direct instruction, drill and practice method, mastery learning, and gaming method employed in the reading software were utilized to support the skill-based drill and practice activities. However, these methods focused on practicing basic reading skills in isolation. The software programs provided few practices that emphasized the importance of meaning that is considered to be the central focus of the reading process. Despite the fact that new reading instructional approaches and computer technology have evolved, it was found from this study that drill and practice methods and the phonics approach that emphasized letter-sound associations and word recognition still play an important role in commercial reading software designed for beginning readers. The mastery learning method was utilized to make skill-based practice more challenging. Multimedia technology made the skill-based drill and practice exercises offered in the software more encouraging and computerized game formats raised the motivation level making learning more enjoyable and engaging. Still, all reading software programs were skill-based drill and practice similar to the commercial software developed in the past twenty years (Balajthy, 1996), regardless the information stated by the publishers.

Recommendations

One of the results from this content analysis study of commercial reading software designed for Pre-K through third grade children was the potential benefit of using the software for the beginning readers.

Recommendations for Parents

1) It is recommended that when considering purchasing commercial reading software for Pre-K through third grade children, parents be aware that the description on the software package does not provide sufficient information. Some software packages may even contain invalid statements. It is better if parents obtain information about the software from reliable sources, such as software review journals, and advice from reading teachers and/or reading professionals, before deciding to buy reading software programs for their children.

2) It is recommended that parents recognize that commercial reading software designed for Pre-K through third grade children currently available in the market are phonics oriented software that emphasize practicing four basic skills: alphabetic principle, letter-sound association, word recognition, and word knowledge or vocabulary in isolation without meaningful contexts. Reading comprehension skills are not the central focus although some software offered many storybooks to read.

3) Because commercial reading software offer phonics skill-based drill and practice exercises in isolation without meaningful contexts, it is recommended that parents not rely only on using reading software programs for developing children's reading skills. Instead, reading software should be used as one resource in a wealth of

material resources children explore at home and in the classroom. Supplementary practice in meaningful reading comprehension activities should be supplied.

4) It is recommended that parents acquire information of their child's reading performance from school. They should work with teachers to determine with which reading skills the child needs assistance or enhancement. Teachers can provide information related to what types of software, skill-based drill and practice oriented or storybook reading oriented, would be appropriate. They should use the reading software programs before selecting and introducing the software to the child.

5) Despite the fact that commercial reading software programs are designed for personalized use, they provide insufficient instructional information (e.g., learning objectives of lessons or exercises, explanation in the tutor mode in the software, software manual). It is recommended that parents use the commercial reading software as a supplement to reading instruction taught in school.

6) In commercial reading software, game strategies were used to motivate children. Playing games in the software may diminish the learning focus. It is recommended that parents interact as their child explores reading software personally at home and help or encourage the child to use the software to develop their reading skills.

7) It is recommended that parents realize and be aware that using drill and practice reading software programs could reduce creativity in children. The reading software programs should be used in appropriate ways, namely for the child's cognitive development and reading skills needed. When appropriately used, the commercial reading software could provide significant benefits to the children.

Recommendations for Teachers

1) Teachers should realize that current commercial reading software is designed basically around the theoretical perspectives that view learning to read as the continuum of the children's oral English language background. It is recommended that teachers encourage children to use their background knowledge about words in order to successfully use the software programs because most software did not provide word meanings.

2) In selecting the reading software, it is recommended that teachers determine what learning objectives for the child are needed in reading skill development. In addition, it is recommended that teachers use the reading software evaluation rubric in this study to assist in the selection of reading software programs commercially available in the market in order to obtain reading software that serve those objectives.

3) Since the reading software programs for Pre-K through third grade children provided insufficient instructional information, it is recommended that teachers provide additional explanation sufficient for children to develop understanding and learning while using the software.

4) It is recommended that teachers realize that the reading software programs lack instructional information and reading comprehension focus. Therefore, the software should be adapted to the instruction, such as using the software to practice skills, especially alphabetic principle, letter-sound association, word recognition, and word knowledge, taught in the classroom.

5) It is recommended that teachers provide information about the children's reading abilities to the parents and advise the parents in pursuing and using the reading software for learning objectives with their children.

6) Finally, it is recommended that teachers preview the software and plan before using commercial reading software programs to beneficially aid reading instruction. Also, the software should be used as personalized learning material for their children when necessary and objectively appropriate.

Recommendations for Researchers

This study has not proven the effectiveness of certain commercial reading software program when used independently or with conjunction with an existing reading program as compared to programs that may not use the software. Research and education would benefit from an extensive study involving the use of the identified potentially effective commercial reading software programs. It would be helpful to know if beginning readers using specific commercial reading software would achieve significant improvement. Additionally, there should be more studies that establish more theoretically desirable characteristics for reading software programs so as to most effectively enhance reading instruction to beginning readers as well as older children.

Conclusions

This qualitative study attempted to provide a description of the currently available commercial reading software designed for Pre-K through third grade children. The study was also designed to provide recommendations for parents, teachers as well as educators using reading software programs to enhance children's learning to read. By using the reading software evaluation rubric established by the researcher, ten current commercial

reading software programs were selected to be analyzed. The researcher reviewed and transcribed the software to obtain the data. The data were coded, categorized, and then interpreted to answer five research questions asking about (1) the reading content offered, (2) the instructional methods employed, (3) the reading models employed, (4) the programming methods used, and (5) the other appealing features utilized in the commercial reading software programs. By using Scott's interrater reliability formula, the coding reliability tested yielded an acceptable reliability level of 0.875.

The research findings revealed that all commercial reading software programs offered content that emphasized phonics instruction of basic reading skills for Pre-K through third grade children. The major skills taught were (a) alphabetic principle, (b) letter-sound associations, (c) word recognition and identification, (d) word knowledge or vocabulary, and (e) story reading and comprehension. All commercial reading software were developed on phonics instruction perspectives although some software emphasized more storybook reading to develop reading skills. The phonics-oriented software programs employed a bottom-up reading model that emphasized skill-based practice to develop basic reading skills that are the foundation of reading comprehension. All commercial reading software programs employed drill and practice and game methods in presenting the content they offered. All reading software programs utilized out-of-context skill-based exercises and practiced skills in isolation. Game type methods were simply used to motivate and engage the learners. Also, the computer multimedia technology, namely voice recognition, record and playback, fantastic game scenarios, extra supplementary printable workbooks and other features of animated cartoon characters, as

well as Internet access, made the reading software programs more appealing. However, they were varied among the software publishers.

Additionally, all commercial reading software program development was based on the theoretical perspective that views learning to read as the continuum of the child's native English language and background. It is recommended that teachers and parents determine the learning objectives and reading skills a child needs to develop and determine what reading software can be adapted and used accordingly to the children's needs. Parents and teachers should be aware that the description on the package of the software may be misleading information. Therefore, when buying and selecting the commercial reading software, if possible, parents should ask for advice or recommendations from reliable sources, such as teachers and software reviews and study. Using the commercial reading software would be beneficial when parents and teachers use them adaptively based on the reading objectives identified and an individual child's needs in reading development. In addition, the currently available commercial reading software could be benefit children when used as an individualized supplementary material to practice skills in alphabetic principle, letter-sound association, word recognition, and word knowledge or vocabulary. The commercial reading software programs offered few meaning-based reading comprehension exercises. However, students should bring background knowledge, especially about words, in order to succeed in using the software as a supplemental material of classroom learning and instruction. Further study should be based on determining the desirable characteristics of the reading software program as well as the effectiveness of those commercial reading software programs when used in particular reading instruction.

APENDIX A

THE COMMERCIAL READING SOFTWARE

EVALUATION FORM AND SAMPLE EVALUATION

Commercial Reading Software Evaluation Form

Software Title :…….. **Age** specified :…..
Publisher/Company :…… **Level** : (Preschool, Kindergarten,
Copyright Year/Version :……..…… 1st Grade, 2nd Grade, 3rd Grade)

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle						
	2. Letter/sound association						
	3. Phonemic awareness						
	4. Vocabulary building (word and its meaning)						
	5. Knowledge about print						
	6. Spelling						
	7. Grammar						
	8. Comprehension						
	Sub Total						
Learning Activities	9. Learning in context						
	10. Enjoyable activities						
	11. Variety of meaningful activities (tutorials, games, etc.)						
	12. Language play (such as songs, plays, rhymes, etc.)						
	13. Oral language activities (listening & speaking)						
	14. Reading aloud to the learner						
	15. Story reading						
	16. Writing activities						
	Sub Total						
Validation	17. Content accuracy						
	18. Universality (free of race, ethnic, sex, stereotype, etc.)						
	19. Built on children's developmental stages						
	20. Presentation in appropriate sequences						
	21. Integrated with children's prior experiences						
	Sub Total						
Motivation	22. Ease of use						
	23. Presentation of content is clear, give example or modeling						
	24. Effectiveness of response or feedback of learning activities						
	25. Learner control of the lesson						
	26. Graphics, colors, sound, fantasy						
	27. Levels of difficulty and challenge						
	28. Speech recognition (provide the learner to speak)						
	Sub Total						
Technical Support	29. Teacher/student manual						
	30. Other documentation						
	Sub Total						
	Total						
	Grand Total						

Final Rating: Excellent Good Moderate Poor

Strength & weaknesses: _____

Commercial Reading Software Evaluation Form

Software Title: JumpStart Phonics
Publisher/Company: Knowledge Adventure
Copyright Year/Version: 1999

Age specified: 3 – 6
Level : Pre-K - 1st Grade

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)		/				
	5. Knowledge about print			/			
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	10	12	6	2	-	-
Learning Activities	9. Learning in context			/			
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading			/			
	16. Writing activities					/	
	Sub Total	15	8	6	-	1	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences		/				
	21. Integrated with children's prior experiences	/					
	Sub Total	20	4	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	20	8	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	70	36	15	2	1	-
	Grand Total	**124**					

Final Rating: Excellent Good Moderate Poor

Strength & weaknesses: good multimedia features / drill and practice focus/ few comprehension practice / no writing activity

Commercial Reading Software Evaluation Form

Software Title: JumpStart Reading for First Graders **Age** specified: 5 – 7
Publisher/Company: Knowledge Adventure **Level** : 2nd Grade
Copyright Year/Version: 1997

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound relation	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)		/				
	5. Knowledge about print		/				
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	10	16	3	2	-	-
Learning Activities	9. Learning in context			/			
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading		/				
	16. Writing activities				/		
	Sub Total	15	12	3	2	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences		/				
	21. Integrated with children's prior experiences	/					
	Sub Total	20	4	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge	/					
	28. Speech recognition (provide the learner to speak)		/				
	Sub Total	20	8	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	70	44	9	4	-	-
	Grand Total	**127**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: fantastic scenarios and game / drill and practice focus/ word knowledge emphasis / few comprehension practice / very few writing activities

Commercial Reading Software Evaluation Form

Software Title: JumpStart Reading for 2nd Graders **Age** specified: 6 – 8
Publisher/Company: Knowledge Adventure **Level** : 3rd Grade
Copyright Year/Version: 1998

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound relation	/					
	3. Phonemic awareness			/			
	4. Vocabulary building (word and its meaning)		/				
	5. Knowledge about print		/				
	6. Spelling		/				
	7. Grammar			/			
	8. Comprehension			/			
	Sub Total	10	12	9	-	-	-
Learning Activities	9. Learning in context				/		
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)			/			
	14. Reading aloud to the learner	/					
	15. Story reading		/				
	16. Writing activities				/		
	Sub Total	15	8	3	4	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences		/				
	21. Integrated with children's prior experiences	/					
	Sub Total	20	4	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge	/					
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	25	4	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	32	15	4	-	-
	Grand Total	**126**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: word knowledge emphasis / drill and practice focus/ more challenging reading comprehension / very few writing activities

Commercial Reading Software Evaluation Form

Software Title: JumpStart Reading for 2nd Graders **Age** specified: 6 – 8
Publisher/Company: Knowledge Adventure **Level** : 3rd Grade
Copyright Year/Version: 1998

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound relation	/					
	3. Phonemic awareness			/			
	4. Vocabulary building (word and its meaning)		/				
	5. Knowledge about print		/				
	6. Spelling		/				
	7. Grammar			/			
	8. Comprehension			/			
	Sub Total	10	12	9	-	-	-
Learning Activities	9. Learning in context				/		
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)			/			
	14. Reading aloud to the learner	/					
	15. Story reading		/				
	16. Writing activities				/		
	Sub Total	15	8	3	4	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences		/				
	21. Integrated with children's prior experiences	/					
	Sub Total	20	4	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge	/					
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	25	4	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	34	15	4	-	-
	Grand Total	**128**					

Final Rating: Excellent Good Moderate Poor

Strength & weaknesses: word knowledge emphasis / drill and practice focus/ more challenging reading comprehension / very few writing activities

Commercial Reading Software Evaluation Form

Software Title: Reader Rabbit Personalized Reading **Age** specified: 4 – 6
Publisher/Company: Learning Company **Level** : Pre-K - 1st Grade
Copyright Year/Version: 1999

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)			/			
	5. Knowledge about print	/					
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	15	8	6	2	-	-
Learning Activities	9. Learning in context		/				
	10. Enjoyable activities		/				
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading	/					
	16. Writing activities					/	
	Sub Total	15	16	-	-	1	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences	/					
	21. Integrated with children's prior experiences	/					
	Sub Total	25	-	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling			/			
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	20	4	6	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	80	32	12	2	1	-
	Grand Total	**127**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: good multimedia features / drill and practice focus/ no writing activity

Commercial Reading Software Evaluation Form

Software Title: Reader Rabbit Learn to Read with Phonics **Age** specified: 3 – 6
Publisher/Company: Learning Company **Level** : Pre-K - 1st Grade
Copyright Year/Version: 2000

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)			/			
	5. Knowledge about print		/	/			
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	10	12	9	2	-	-
Learning Activities	9. Learning in context		/				
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading			/			
	16. Writing activities					/	
	Sub Total	15	12	3	-	1	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences	/					
	21. Integrated with children's prior experiences	/					
	Sub Total	25	-	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	20	8	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	36	15	2	1	-
	Grand Total	**129**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: good storybook reading / drill and practice skill-based exercise focus / few comprehension and writing activities

Commercial Reading Software Evaluation Form

Software Title: Reader Rabbit I Can Read with Phonics **Age** specified: 5 – 8
Publisher/Company: Learning Company **Level** : 2nd Grade
Copyright Year/Version: 1998

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)		/				
	5. Knowledge about print		/				
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	10	16	3	2	-	-
Learning Activities	9. Learning in context			/			
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)	/					
	14. Reading aloud to the learner	/					
	15. Story reading			/			
	16. Writing activities					/	
	Sub Total	20	4	6	-	1	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences		/				
	21. Integrated with children's prior experiences	/					
	Sub Total	20	4	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	20	8	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	36	12	2	1	-
	Grand Total	**128**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: series of storybooks / drill and practice focus/ very few writing activities / insufficient explanation of feedback or response of activities

Commercial Reading Software Evaluation Form

Software Title: Reader Rabbit's Reading **Age** specified: 6 – 9
Publisher/Company: Learning Company **Level** : 3rd Grade
Copyright Year/Version: 1998

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle		/				
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)			/			
	5. Knowledge about print		/				
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	10	16	6	2	-	-
Learning Activities	9. Learning in context			/			
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading			/			
	16. Writing activities				/		
	Sub Total	15	8	6	2	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences		/				
	21. Integrated with children's prior experiences	/					
	Sub Total	20	4	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)	/					
	Sub Total	20	8	3	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	70	36	15	6	-	-
	Grand Total	**127**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: record and playback features/ series of storybook reading / drill and practice focus/ very few writing activities

Commercial Reading Software Evaluation Form

Software Title: Reading Blaster
Publisher/Company: Knowledge Adventure
Copyright Year/Version: 2000

Age specified: 4 – 6
Level : Pre-K - 1st Grade

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)			/			
	5. Knowledge about print		/				
	6. Spelling		/				
	7. Grammar				/		
	8. Comprehension			/			
	Sub Total	10	12	6	2	-	-
Learning Activities	9. Learning in context			/			
	10. Enjoyable activities	/					
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading	/					
	16. Writing activities				/		
	Sub Total	20	8	3	2	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences	/					
	21. Integrated with children's prior experiences	/					
	Sub Total	25	-	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling		/				
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)			/			
	Sub Total	15	8	6	-	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	32	15	4	-	-
	Grand Total	**126**					

Final Rating: Excellent Good Moderate Poor

Strength & weaknesses: good multimedia features / fantastic game / drill and practice focus/ drawing features/ email writing activity

Commercial Reading Software Evaluation Form

Software Title: Reading Blaster **Age** specified: 6 – 7
Publisher/Company: Knowledge Adventure **Level** : 2nd Grade
Copyright Year/Version: 2000

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)			/			
	5. Knowledge about print	/					
	6. Spelling		/				
	7. Grammar			/			
	8. Comprehension			/			
	Sub Total	15	8	9	-	-	-
Learning Activities	9. Learning in context		/				
	10. Enjoyable activities		/				
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading	/					
	16. Writing activities			/			
	Sub Total	15	16	3	-	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences	/					
	21. Integrated with children's prior experiences	/					
	Sub Total	25	-	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling			/			
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)				/		
	Sub Total	15	4	6	2	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	32	18	2	-	-
	Grand Total	**127**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: good multimedia features / fantastic game / drill and practice focus/ email writing activity

Commercial Reading Software Evaluation Form

Software Title: Reading Blaster **Age** specified: 7 – 8
Publisher/Company: Knowledge Adventure **Level** : 3rd Grade
Copyright Year/Version: 2000

Rating: 5 = Excellent, 4 = Good, 3 = Moderate, 2 = low, 1 = Weak, 0 = Not Applicable

		5	4	3	2	1	0
Reading Content	1. Alphabetic principle	/					
	2. Letter/sound association	/					
	3. Phonemic awareness		/				
	4. Vocabulary building (word and its meaning)			/			
	5. Knowledge about print	/					
	6. Spelling		/				
	7. Grammar			/			
	8. Comprehension			/			
	Sub Total	15	8	9	-	-	-
Learning Activities	9. Learning in context		/				
	10. Enjoyable activities		/				
	11. Variety of meaningful activities (tutorials, games, etc.)		/				
	12. Language play (such as songs, plays, rhymes, etc.)	/					
	13. Oral language activities (listening & speaking)		/				
	14. Reading aloud to the learner	/					
	15. Story reading	/					
	16. Writing activities			/			
	Sub Total	15	16	3	-	-	-
Validation	17. Content accuracy	/					
	18. Universality (free of race, ethnic, sex, stereotype, etc.)	/					
	19. Built on children's developmental stages	/					
	20. Presentation in appropriate sequences	/					
	21. Integrated with children's prior experiences	/					
	Sub Total	25	-	-	-	-	-
Motivation	22. Ease of use	/					
	23. Presentation of content is clear, give example or modeling			/			
	24. Effectiveness of response or feedback of learning activities			/			
	25. Learner control of the lesson	/					
	26. Graphics, colors, sound, fantasy	/					
	27. Levels of difficulty and challenge		/				
	28. Speech recognition (provide the learner to speak)				/		
	Sub Total	15	4	6	2	-	-
Technical Support	29. Teacher/student manual	/					
	30. Other documentation		/				
	Sub Total	5	4	-	-	-	-
	Total	75	32	18	2	-	-
	Grand Total	**127**					

Final Rating: Excellent Good Moderate Poor
Strength & weaknesses: good multimedia features / fantastic game / drill and practice focus/ email writing activity

APENDIX B

THE ANNOTATED COMMERCIAL READING SOFTWARE SELECTED FOR THE STUDY

The Annotated Commercial Reading Software Selected for the Study

JumpStart Phonics, Ages 3-6. (1999). Torrance, CA: Knowledge Adventure, Inc.

Given Camp Readalot scenario, JumpStart Phonics offers five distinct activities. Each is designed with an associated game with animated cartoon characters and three skill levels to ensure that skills from alphabet principle, letter-sound association, spelling and knowledge about words, and reading stories are covered. Children can choose to read and speak their responses by using the speech recognition technology, or simply point and click as appropriate. The software includes songs and a complete printable workbook.

System requirement: Windows 98/95, Pentium 100 MHz or higher, 16 MB RAM, 256-color display, or Macintosh Power PC 120 MHz or higher, System 7.5.3 or higher.

JumpStart Reading for First Graders, Ages 5-7. (1997). Torrance, CA: Knowledge Adventure, Inc.

Given an adventurous circus scenario, Frankie and a circus dog need help from children to find their old friends and fellow performers by finding the puzzle pieces throughout the carnival. The student must play a number of carnival games that help build reading skills: consonant blending, vowel sounds, spelling, synonyms and antonyms, rhyming words, vocabulary, and sentence building. Each activity features three difficulty levels. A printable workbook and a tutorial mode are included.

System requirement: Windows 98/95, Pentium 100 MHz or higher, 16 MB RAM, 256-color graphic display, or Macintosh Power PC 120 MHz or higher, System 7.53 or higher.

JumpStart Reading for Second Graders, Ages 6-8. (1998). Torrance, CA: Knowledge Adventure, Inc.

Given the imaginary scenario of the Lost City of Ursalab, children must help CJ the Frog and Edison accomplish their adventurous mission to bring back the lost city through activities. The software offers eight distinctive activities with three difficulty skill levels to ensure that children learn the alphabetic principle, letter-sound association, word knowledge, vocabulary, sentence building, and non-book story comprehension. The tutorial explanation mode, a printable workbook, and songs are included.

System requirement: Windows 98/95, Pentium 100 MHz or higher, 16 MB RAM, high 256-color graphic display, or Macintosh Power PC 120 MHz or higher, System 7.5.3 or higher.

Reader Rabbit's Reading, Ages 6-9. (1998). Cambridge, MA: The Learning Company, Inc.

In search of imagination from two theme scenarios of Wordville and Reading Lands, Reader Rabbit and Sam the Lion lead children on fantastic adventures that sharpen their reading skills. Children practice skills with 30 readable interactive storybooks. The 15 Reading Land activities encourage children to learn letter-sound relationships, rhyming words, word building, vocabulary, and comprehension skills. The program includes record and playback features, progress tracking, and printable storybooks and worksheets.

System requirement: Windows 3.1, 95/98, Pentium or higher, 8 MB RAM, 256-color SVGA, or Macintosh 33 MHz or higher, 256-color display, 16 MB RAM, System 7.0.1 or higher, and a microphone.

Reader Rabbit Personalized Reading, Ages 4-6. (1999). Fremont, CA: The Learning Company, Inc.

Given the Reading Kingdom, Reader Rabbit, Mat the Mouse, and Sam the Lion lead children on fantastic adventures that sharpen their reading skills. Children practice skills with 40 readable interactive storybooks and four skill levels. The 20 Reading Land activities encourage children to learn the alphabetic principle, letter-sound relationship, word recognition and identification, rhyming words, word and sentence building, Children also learn comprehension skills to bridge the reading lands. The program includes record and playback features, help, and printable storybooks and 50 activities.

System requirement: Windows 486DX, 98/95, Pentium 66 MHz or higher, 256-color display, 16 MB RAM, or Macintosh Power PC system 7.1 or higher, 16 MB RAM.

Reader Rabbit: Learn To Read With Phonics, Ages 3-6. (2000). Navato, CA: The Learning Company, Inc.

Reader Rabbit Learn to Read with Phonics offers a systematic approach to learning to read in 26 adventure-packed Letter Lands as well as a free-play option of Word Factory. Children must read 64 readable storybooks through the adventurous letter lands and practice skills of alphabetic principle, letter-sound association, word building, sight words, spelling, vocabulary, and comprehension. The step-by-step reading program with five skill levels is designed to help children build foundation skills of reading success. The program includes seven songs, record and playback features, printable workbooks and rewards.

System requirement: Windows 95/98, Pentium 90 MHz or higher, 16 MB RAM, 256-color display, or Macintosh, Power PC 16 MB RAM, System 7.5.5 or higher.

Reader Rabbit: I Can Read With Phonics, Ages 5-8. (2000). Navato, CA: The Learning Company, Inc.

Following the two imagination scenarios of Road to Reading and Wordville Station, Reader Rabbit, Sam the Lion and friends lead children on a fantastic journey that sharpens their reading skills. Children practice skills with 30 readable interactive storybooks. The 15 Reading Land activities featuring 3-4 skill levels encourage children to learn letter-sound relationships, rhyming words, word building, knowledge about words or vocabulary, and comprehension skills. The program includes record and playback features, progress reports, automatic help, and printable activities.

System requirement: Windows 95/98, Pentium 90 MHz or higher, 16 MB RAM, 256-color display, or Macintosh, Power PC 16 MB RAM, System 7.5.5 or higher.

Reading Blaster, Ages 4-6. (2000). Torrance, CA: Knowledge Adventure.

This Reading Blaster program is designed for kindergarteners specifically to drill basic reading skills. Max Blaster and his alien buddy G.C. dive down to an underwater world, where undisclosed treasure is hiding. Finding the treasure is simple – the learners must earn stars by successfully completing reading activities in five different learning activities with five distinct ability levels. Children will learn letter recognition, alphabetic principle, letter-sound association, rhyming word, spelling, word knowledge, and simple sentence construction. The program includes eight read-along stories, 300 vocabulary words on printable flash cards, a message board, B-Mail, and virtual classroom access.

System requirement: Windows 98/95, Pentium 133 MHz or higher, 32 MB RAM, High color (16 bit) display, or Macintosh, Power PC 120 MHz or higher, 12 MB RAM, System 7.6.1 or higher. Thousands of colors display.

Reading Blaster, Ages 6-7. (2000). Torrance, CA: Knowledge Adventure.

Given the Planet of Lost Things scenario, by playing games students practice and learn building words from sounds, spelling words, sequencing words to make sentences and sentences to make a story, using punctuation and capitalization, following directions, identifying parts of speech, recognizing consonant and vowel sounds. The program features five skill levels and includes B-Mail activity, 15 read-along storybooks, printable word search puzzles, a message board to play with letters and words, and a virtual online classroom.

System requirement: Windows 98/95, Pentium 133 MHz or higher, 32 MB RAM, High color (16 bit) display, or Macintosh, Power PC 120 MHz or higher, 12 MB RAM, System 7.6.1 or higher. Thousands of colors display.

Reading Blaster, Ages 7-8. (2000). Torrance, CA: Knowledge Adventure.

Take off with the Blaster pal for Islandia, where the book-napping Mumblers are leaving the planet at a loss for words. Featuring five skill levels, children learn letter-sound recognition and identification, spelling, knowledge about words (e.g., part of speech, prefixes and suffixes, antonyms, synonyms, homophones), sequencing words to make sentences, and comprehension. Over 2,000 vocabulary words are learned. The program includes 25 read-along storybooks, B-Mail and message board activities, printable crossword and word search puzzles, and a virtual online classroom.

System requirement: Windows 98/95, Pentium 133 MHz or higher, 32 MB RAM, High color (16 bit) display, or Macintosh, Power PC 120 MHz or higher, 12 MB RAM, System 7.6.1 or higher. Thousands of colors display.

APPENDIX C

WORD LIST FROM THE READING SOFTWARE:

PRE-K THROUGH THIRD GRADE

Word List from the Reading Software: Pre-K to Third Grade

able	agree	always	anyone	arrange
about	aid	am	anyplace	arrive
above	air	amazing	anything	arrow
absent	airplane	amuse	anyway	arrowhead
acorn	airport	amusing	ape	art
across	alike	an	appear	artist
act	alive	and	appeared	artistic
action	all	angel	apple	as
actor	alligator	anger	apples	ask
add	allow	angles	applesauce	asking
added	allowance	angrily	applied	asks
address	allowed	angry	apply	asleep
addresses	almost	animal	arc	assistant
adopt	alone	animals	are	astonish
adult	along	announce	area	astronaut
adventure	aloud	annoy	argue	at
after	alphabet	another	arid	ate
afternoon	already	answer	arithmetic	athletic
again	also	ant	arm	attach
against	although	antenna	arms	attached
age	altogether	any	army	attend
agent	aluminum	anybody	around	aunt

author
average
awake
away
awful
awfully
babies
baby
back
backbone
backed
backpack
backward
backyard
bacon
bad
badger
badly
bag
bail
bait
bake
baked
baker
bakery
baking
bald
bale
ball
balloon
balloons
ban
banana
band
bang
bank
barber
bare
barefoot
barely
bark
barn
barnyard
barrel
base
baseball
basement
bask
basket
basketball
bat
batches
bath
bathroom
bathtub
bats
bawl
bay
be
beach
beaches
bead
beak
beaks
beam
bean
bear
beast
beat
beautiful
beautifully
became
because
bed
bedroom
bedtime
bee
beef
beehive
been
beep
beet
before
beg
began
begin
begun
behind
beige
being
bell
bellies
below
belt
bench
benches
bend
beneath
bent
berries
berry
beside
best
bet
better
between
beverage
beyond
bib
bicycle
bid
big
bigger
biggest
bike

bikes
bill
bin
bird
birdbath
birds
birth
birthday
bit
bite
biting
bitten
bitter
blab
black
blackberry
blade
blame
bland
blank
blanket
blast
blaze
bleak
bleat
bled
bleed
bleep
blend
blender
bless
blessed
blesses
blew
blimp
blind
blink
bliss
blob
block
blocks
blond
blonde
bloom
blot
blotch
blouse
blow
blown
blows
blue
blueberry
bluebird
bluff
blur
blush
board
boast
boat
boats
bodies
body
bog
boil
bold
boldly
bond
bone
bones
boo
book
bookcase
books
boom
boot
booth
boots
bop
bore
bored
boredom
boring
boss
both
bottom
bounce
bounced
bound
boundary
bow
bowl
box
boxes
boxing
boy
boys
brace
bracelet
brag
braid
brain
brake
branch
branches
brand
brash
brass
brat
brave
bravely
brawn
bread
break
breakfast
breaking

breaks
breath
breathe
bred
breed
breeze
breezy
bribe
brick
bride
bridge
brief
bright
brighter
brightly
brim
bring
bringing
brings
brisk
broadly
broccoli
broke
broken
broom
broomstick
broth
brother
brow
brown
brows
bruise
brush
brushed
brushes
brute
buck
bud
buffalo
bug
build
building
bulb
bulbs
bulldog
bullfrog
bum
bumblebee
bump
bumpy
bun
bunch
bunches
bunk
bunnies
bunny
burglar
burn
burned
bus
buses
bush
bushes
busily
busy
but
butcher
butter
buttercup
butterflies
butterfly
button
buy
by
bye
byte
cab
cabin
caboose
cactus
cage
cake
calculate
calendar
calf
call
called
calm
calmly
calves
came
camel
camera
camp
camped
campfire
campground
can
candies
candle
candy
cane
cannot
canoe
canyon
cap
cape
capture
car
card
cardboard
cards
care
careful
carefully

careless
carelessly
cargo
carnival
carpet
carpool
carried
carrot
carry
cartwheel
carve
cash
cast
castle
cat
catch
catcher
caterpillar
caught
caution
cave
cedar
ceiling
celebrate
celery
cell
cellar
cement
cent
center
central
cereal
certain
certainly
chain
chair
chairs
chalk
chalkboard
champ
chance
change
changeable
chant
chap
chart
chase
chased
chat
chatter
cheap
cheat
check
cheek
cheer
cheerful
cheerfully
cheese
cheeseburger
cherries
cherry
chess
chest
chew
chick
chicken
chicks
chief
child
childhood
children
chill
chime
chimp
chimpanzee
chin
chip
chips
chocolate
choice
choke
choose
chop
chops
chord
chore
chose
chosen
chow
chuckle
chug
chunk
church
churches
cider
cinnamon
circle
circus
cities
citizen
city
claim
clam
clamp
clang
clap
clarinet
clash
clasp
class
classes
classic
classmate
classroom
claw

clay	clothes	coin	contain	count
clean	cloud	cold	contest	counted
cleaned	clouds	colder	continue	countries
clear	cloudy	color	continued	country
clearly	clown	colorful	control	course
cleat	club	colorfully	convoy	cousin
clever	clue	comb	cook	cover
click	clump	come	cookie	covered
cliff	clung	comet	cool	cow
climb	clunk	comfortable	cop	cowardly
climbed	clutches	comic	cope	cowboy
cling	coach	coming	copy	crab
clink	coaches	commercial	cord	crack
clip	coal	commonly	core	crackers
clipboard	coarse	communities	corn	cradle
clock	coast	company	correct	craft
clog	coat	compass	cost	cramp
close	cob	complain	costume	crane
closed	cockroach	complete	cot	crank
closer	cod	computer	cotton	crash
closet	code	cone	couch	crate
clot	coffeepot	constant	could	crawl
cloth	cog	constantly	couldn’t	crayon

crayons	crowd	curvy	daughter	dell
crazy	crown	custom	dawn	den
creak	crumb	cut	day	dent
cream	crunch	cute	daydream	deny
create	crush	cyclone	days	depart
creature	crust	cymbal	daytime	department
creek	crutch	dab	daze	deploy
creep	cry	dad	dead	describe
crept	cub	dairy	deal	desert
crest	cube	daisy	dear	desire
crew	cucumber	dam	decide	desk
crib	cud	damp	deck	desks
cried	cue	dance	decline	destroy
cries	cuff	danced	decode	dew
crime	cup	danger	decorate	diagram
crisp	cupboard	dangerous	decoy	diamond
croak	cupcake	daring	decrease	dice
crook	curb	dark	deed	dices
croon	cure	darker	deep	dictionary
crop	curious	dash	deer	did
cross	curiously	dashed	delay	didn’t
crosswalk	curly	dashes	delicious	die
crow	curtain	date	delightful	difference

different
dish
door
drape
drive
differently
dishes
doorbell
drat
driveway
difficult
dishpan
doorknob
draw
drop
dig
disk
doors
drawbridge
drops
digest
disobey
doorway
drawer
drove
digs
display
dot
drawing
drug
dill
ditch
doubt
drawn
drugstore
dim
dive
dough
draws
drum
dime
do
doughnut
dread
drums
din
dock
doughnuts
dream
drunk
dine
doctor
dove
dreamed
dry
dinner
doe
down
dress
dub
dip
does
downhill
dressed
duck
direction
dog
downstairs
dresses
duckling
dirt
doghouse
downstairs
drew
ducks
dirty
dogs
downtown
dried
ducky
disagree
doll
drab
drift
due
disagreeable
dollar
draft
drifts
duel
disappear
dolphin
drag
drill
dug
disappoint
dome
dragon
drink
duke
discover
don
dragonfly
drinking
dull
discovered
done
drain
drinks
dumb
disgusting
donkey
drank
drip
dump

dune	eats	enjoyable	exciting	faith
dunk	edge	enough	exclaim	faithful
dusk	eel	entire	exhale	fake
dust	egg	envelope	expand	fall
dusty	eggs	equally	expect	fallen
dye	eggshell	eraser	explain	falling
dying	eight	error	explained	falls
each	either	escape	eye	false
eagerly	eject	especially	eyebrow	false
ear	electrical	even	eyelash	falsely
early	elephant	evening	eyelashes	fame
earn	elevator	ever	eyelid	families
earring	eleven	every	face	family
earth	elf	everybody	facing	fan
earthquake	employ	everyday	fact	fancy
ease	employee	everyone	factory	fantastic
easily	employment	everything	fad	far
east	empty	everywhere	fade	fare
eastern	end	exactly	fail	farm
easy	enemy	exam	faint	farmer
eat	energy	example	fair	farmhouse
eaten	engine	except	fairies	fast
eating	enjoy	excite	fairy	faster

fastest	fib	firefighter	flat	flu
fat	field	fireman	flavor	fluff
fate	fierce	fireplace	flea	flunk
father	fiercely	fireworks	fled	flush
favorite	fifteen	first	flee	flute
fawn	fifth	fish	flew	fly
fear	fig	fished	flick	foam
fearfully	fight	fisherman	flies	fog
feat	figure	fishes	flight	foggy
feathers	file	fist	flip	fold
fed	fill	fit	float	follow
fee	filled	five	floated	followed
feed	fin	fix	flock	food
feel	final	fixed	flood	foolish
feet	finally	fixes	floors	foolishly
fell	find	flag	flop	foot
fellow	finds	flagpole	florist	football
felt	fine	flake	floss	football
female	fingernail	flame	flour	footprint
fence	finish	flap	flow	footrest
ferry	fir	flash	flower	footstep
fetch	fire	flashed	flowers	for
few	fire-hydrant	flashlight	flown	fore

forearm
forehead
foremost
forest
forever
forget
forgive
fork
form
formed
forth
fortune
forward
fought
foul
found
four
fourteen
fourth
fowl
fox
foxes
frail
frame
freak
freckles
free
freed
freedom
frees
freeway
freeze
freight
fresh
freshly
fret
friend
friendly
friends
friendship
fries
fright
frightened
frill
frisk
frisky
frock
frog
from
front
frost
frown
froze
frozen
fruit
fruits
fry
fudge
fuel
full
fully
fun
fund
funniest
funny
fur
fuse
fuzz
gab
gag
gain
gained
galaxy
gallon
game
games
gap
garden
gas
gases
gash
gate
gather
gave
gaze
gel
gem
general
generous
genius
gentle
gentleman
gently
geometry
germ
get
ghost
giant
gift
gifts
gig
gigantic
ginger
gingerbread
giraffe
girl
girls
give
given
glad
gladly
glance
glare
glass
glasses

gleam
glen
glide
glider
glitter
glob
globe
gloom
gloss
glove
gloves
glow
glue
glum
go
goal
goat
gob
goes
gold
goldfish
gone
good
gooey
goose
gorilla
got
grab
grabs
grace
grade
grain
gram
grand
grandfather
grandma
grandmother
grant
grape
grapefruit
grapes
graph
grasp
grass
grasshopper
grate
gray
grease
great
greatest
greatly
greed
greedily
greedy
green
greet
grew
grid
grief
grill
grim
grin
grind
grip
groan
grouchy
ground
group
grove
grow
growl
grown
growth
grub
grump
grumpy
grunt
guess
guessed
guesses
guest
gum
gun
gut
guy
gym
gymnasium
gypsy
gyroscope
had
hag
hail
hair
hairbrush
haircut
hairy
half
hall
halves
ham
hammer
hamster
hand
handprint
hands
handshake
handwriting
hang
hanger
happened
happier
happiest
happily
happy
hard

hardly	healthy	here	hobbies	horrible
hare	heap	hero	hoe	horse
hark	hear	heroes	hoes	horsefly
harm	heard	hers	hog	horseshoe
has	hears	hi	hold	hose
hash	heart	hid	hole	hospital
hasn’t	heat	hidden	holiday	host
hat	heavier	hide	hollow	hot
hatch	heavy	high	home	hotdog
hatched	heel	higher	homemade	hound
hatchet	height	highest	homework	hour
hate	helicopter	highly	honest	hourly
haul	help	highway	honestly	house
have	helped	hike	honk	how
hawk	helpful	hill	honor	however
hay	helpless	him	honorable	howl
he	penniless	himself	hood	hub
head	hem	hint	hook	hue
headache	hen	hip	hoop	hug
headquarter	hen	his	hoot	huge
heal	hens	historic	hop	hum
healed	her	hit	hope	humorous
health	herd	hive	hopscotch	hump

hunch	imagine	inside	jail	juice
hundred	imagined	instead	jam	juicy
hundredth	immature	interact	jar	jump
hung	immediately	interesting	jaw	jumped
hungrily	imperfect	interrupt	jeans	jumping
hungry	import	intersection	jelly	jumps
hunk	important	into	jellybeans	jumpy
hunt	importantly	invent	jellyfish	jungle
hurried	impossible	inventor	jest	junk
hurry	improve	invest	jet	junkyard
hurt	in	invite	jewel	just
husband	inactive	invited	jewelry	jut
hush	inch	ion	jig	jute
husk	inches	irregular	job	kangaroo
hut	include	is	jog	kangaroos
hyena	incomplete	island	join	keep
ice	increase	it	joke	keeps
idea	indeed	its	jot	keg
identify	independent	itself	journey	kept
if	inhale	jab	joy	key
igloo	inject	jacket	judge	keys
ill	ink	jacks	jug	kick
illegal	inn	jag	juggled	kicked

kid	knock	large	lean	letter
kin	knot	larger	leap	lettuce
kind	know	largest	learn	libraries
kinder	knowledge	lark	learned	lice
kindest	known	lash	leash	lick
kindly	knuckle	last	leashes	lid
kindness	lab	latched	least	lie
king	lace	latches	leather	life
kingdom	lack	late	leave	lifeboat
kiss	lad	lately	leaves	lifeguard
kissed	ladies	later	led	lifetime
kisses	ladle	laugh	ledge	lift
kit	lady	laughed	left	light
kite	ladybug	launch	leg	lightly
kitten	lag	lavender	lemon	lightning
knee	lake	law	lemonade	lights
kneel	lakes	lawn	lend	like
knew	lamb	lax	length	likes
knife	lame	lay	lengthen	limb
knight	lamp	lazily	lent	lime
knit	land	lead	less	limp
knives	lane	leaf	lesson	line
knob	lap	leak	let	link

lion	look	luck	mall	maze
lip	lookout	lucky	man	me
lipstick	looks	lumber	mane	meadow
list	loose	lump	many	meal
listen	loosely	lunch	map	mean
lit	lop	lunches	mark	measure
little	lose	lung	market	meat
live	losses	lute	markets	medicine
lively	lost	mad	married	meet
lives	lot	made	mash	meets
lizard	lots	madly	mashed	mellow
load	loud	magazine	mashes	melody
loaf	louder	magically	mask	melt
loan	loudest	magnet	masks	memo
loaves	loudly	maid	mast	memory
lob	lovable	mail	mat	men
lock	love	mailbox	match	mend
lodge	lovely	mailman	matches	merchant
loft	low	main	mate	mesh
log	lower	mainly	math	mess
lonely	lox	make	may	message
long	loyal	making	maybe	messed
longest	loyalty	male	mayor	messes

messy	misspell	monkey	moved	name
met	mist	month	moving	nap
mice	mistake	monthly	mow	narrow
microscope	misunderstood	mood	much	narrowly
mid	mite	moon	mud	nation
middle	mitt	moonlight	mug	naughty
midnight	mitten	mop	mule	near
might	mittens	mope	munch	nearly
mild	mix	more	museum	neat
mile	mixed	morning	mush	neater
milk	mixes	mosquito	music	neatly
mill	mixture	most	musical	neck
mind	moan	moth	musically	necklace
mine	moat	mother	musician	need
mink	mob	motor	musk	needle
mint	mock	motorbike	must	neighborhood
minute	moist	motorboat	mute	neither
mirror	mold	motorcycle	my	nerve
mischief	mole	mound	myself	nest
misfortune	mom	mountain	nab	net
miss	moment	mouse	nag	never
misses	mommies	mouth	nail	new
missing	money	move	nails	newer

newspaper	nonsense	nursery	onto	over
next	nonviolent	nut	open	overactive
nib	noon	nuts	opened	overcoat
nibbled	nope	nylon	opera	overgrown
nice	nor	oak	operate	overnight
nicely	north	oat	opinion	overprice
nicer	northeast	object	opponent	own
nick	nose	ocean	opposite	owner
niece	not	octagon	or	ox
night	notch	odd	orange	pace
nightgown	note	odor	order	pack
nine	notebook	of	orderly	pad
nip	nothing	off	organ	page
nit	notice	offer	ostrich	paid
no	now	office	other	pail
nobody	nub	often	ouch	pain
nod	numb	oil	our	paint
noise	number	old	ourselves	paintbrush
noisier	number	oldest	out	paintbrushes
noisily	numbers	on	out of	painted
noisy	numeral	once	outdoors	painter
non	nun	one	outside	pair
none	nurse	only	oval	pajamas

pal	pat	pen	piano	pipe
pale	patch	pencil	pick	pit
pan	patches	pencils	picked	pitch
pancake	path	penguin	pickle	pitcher
pancakes	patiently	pennies	picks	pizza
pane	pattern	pens	picnic	place
pant	pawn	people	picture	plain
pants	pay	pep	pie	plainly
paper	payment	pepper	piece	plan
paragraph	peace	peppermint	pieced	plane
pare	peacefully	percent	pies	planet
parent	peach	perhaps	pig	plant
park	peaches	personal	pigeon	plants
parrot	peak	pest	pigtail	plastic
part	peal	pet	pile	plate
parties	peanut	pew	pill	play
party	pear	phase	pillow	played
pass	peas	pheasant	pin	players
passed	peek	phone	pinch	playground
passenger	peel	phone booth	pine	playing
password	peeled	photo	pineapple	play-pen
past	peep	photograph	pink	plays
paste	peg	physician	pint	plea

pleasant
pleasantly
please
pleasure
pleat
pledge
plenty
plop
plot
plow
ploy
pluck
plug
plum
plumber
plump
plus
plush
pod
point
pointed
pointy
poke
pole
policewoman
polite
politely
polygon
pond
pond
pony
ponytail
poodle
pool
pooling
pools
poor
poorly
pop
popcorn
porch
pose
post
post office
postoperative
postwar
pot
potato
potatoes
pound
pour
powerful
powerfully
pox
practice
pray
precaution
predict
prefix
prepare
present
president
press
pressed
presses
pretend
prettily
pretty
pretzel
prevent
preview
price
pride
prime
prince
princess
principal
print
printed
prize
prizes
probe
problem
products
program
promise
prone
prop
propeller
protect
protective
proud
proudly
prune
pry
puck
puddle
pull
pulled
pump
pumpkin
pun
punch
punk
punt
pup
puppet
puppies
puppy
purchase
pure
purify
purple
purse
pursue

push	quit	rake	rear	rent
put	quite	ram	reason	repair
puts	quiz	ramp	receive	repay
puzzle	rabbit	ran	reckless	repeat
python	race	ranch	recognize	replace
quack	raced	rang	recognized	reply
quail	rack	range	rectangle	report
quaint	radio	ranger	recycle	rescue
quake	radios	rank	recycled	respond
qualify	raft	rap	red	rest
quarter	rag	rapidly	redo	restaurant
quarterback	raid	rare	reef	rested
queen	rail	rash	reel	retire
quest	railroad	rat	referee	retreat
question	rain	rate	refrigerator	retroactive
quick	rainbow	rather	rejoice	retrospect
quicker	raincoat	rattlesnake	relationship	return
quickly	raindrop	raw	relaxed	returned
quiet	raindrops	reach	relay	rhyme
quieter	rained	reached	reliable	rib
quietly	rainfall	read	remain	rice
quill	rainy	real	remember	rich
quilt	raise	really	remove	rid

ridden	robot	round	sag	saw
ride	rock	roundly	sage	sax
rider	rocket	row	said	say
rift	rocks	rowboat	sail	says
rig	rod	rows	sailboat	scab
right	rode	royal	sailed	scale
rim	role	rub	sailor	scarce
rind	roll	rude	sale	scare
ring	rolled	rudely	same	scarecrow
rink	rollerskate	rug	sand	scared
rinse	romp	rule	sandbox	scarf
rip	roof	ruler	sandpaper	scarves
ripe	roofs	run	sandwich	scatter
rise	room	runs	sandwiches	scene
risen	roost	runt	sang	scent
risk	rooster	rush	sank	schedule
river	root	rust	sap	school
roach	rope	rut	sat	schoolhouse
road	rose	sack	satisfy	scissors
roam	rot	sad	sauce	scoot
roast	rough	sadly	saucer	scopes
rob	rougher	safe	save	scorch
robe	roughly	safely	saves	score

scout	second	several	shell	should
scram	secret	sew	shelves	shout
scramble	see	shack	shift	shove
scrap	seed	shade	shin	shovel
scrape	seeing	shadow	shine	show
scratch	seek	shaft	shines	showed
scream	seem	shake	shiny	shower
screen	seen	shaken	ship	shred
screw	sees	shame	ships	shrimp
screwdriver	seize	shape	shipwreck	shrink
scribble	self	shaped	shirt	shrinkage
script	selfish	share	shirts	shrivel
scroll	selfishly	shark	shock	shrub
scrub	sell	sharp	shoe	shrug
scrubs	selves	sharply	shoes	shush
sea	send	shave	shook	shut
seal	sent	shawl	shoot	shy
seam	sentence	she	shop	shyly
search	serious	shed	short	sick
seashell	seriously	sheep	shorter	sickly
season	serve	sheer	shortly	side
seat	set	sheet	shorts	sidewalk
seclude	seven	shelf	shot	sift

sight	skate	slate	slower	snack
sign	skateboard	sled	slowest	snacks
silent	skates	sleep	slowly	snag
silently	skeleton	sleepy	slows	snail
silk	sketch	sleeve	slug	snake
sill	ski	sleigh	slush	snap
silly	skid	sleight	sly	snatch
silver	skies	slept	smack	sneak
simple	skill	slice	small	sneakers
since	skillful	slid	smaller	sneeze
sing	skillfully	slide	smallest	sneezed
singing	skin	slides	smart	sniff
sings	skinny	slim	smartly	snip
sink	skip	slime	smash	snob
sinking	skirt	slimy	smell	snore
sinks	skull	slip	smelled	snow
sip	skunk	slipper	smile	snowball
sister	sky	slips	smock	snowflake
sit	slab	slit	smog	snowman
site	slam	slob	smoke	snub
sits	slant	slop	smooth	snug
six	slap	slot	smoother	snuggle
size	slat	slow	smoothly	so

soak	somewhere	special	spoken	squeeze
soap	son	sped	sponge	squint
soar	song	speeches	spoon	squirt
sob	soon	speed	sport	stab
soccer	sop	speedy	spot	stack
sock	sore	spell	spotlight	stadium
socks	sought	spelled	sprain	staff
sod	soul	spend	sprang	stage
sofa	sound	spent	sprawl	stain
soft	soup	spice	spray	stair
softer	sour	spicy	spread	stairs
softest	south	spider	spree	stake
softly	southwest	spill	spring	stale
soil	sow	spin	springtime	stalk
sold	space	spine	sprinkle	stamp
soldier	spaceship	spins	sprint	stand
sole	spank	spit	sprout	stapler
some	spare	splash	spruce	star
somebody	spark	splashed	spy	stare
someday	spat	splatter	square	starfish
someone	speak	split	squash	stark
something	speaks	spoil	squawk	start
sometimes	spear	spoke	squeak	startle

starved	stinging	strange	strum	sugar
stash	stink	strangely	strums	suit
state	stir	strap	strut	suitcase
station	stitch	straw	stub	sum
statue	stitches	strawberries	stuck	summer
stay	stock	strawberry	studied	sun
staying	stole	stray	study	sunbeam
stays	stolen	streak	stuff	sundown
steak	stomp	stream	stuffed	sunflower
steal	stone	street	stump	sung
steam	stood	stress	stung	sunk
steamboat	stool	stretch	stunt	sunny
steel	stoop	strike	sty	sunrise
steep	stop	string	style	sunset
steer	stop sign	strip	sub	sunshine
stem	stopped	stripe	submarine	sup
step	store	strive	subtract	supermarket
stew	stores	stroke	succeed	supervisor
stick	stories	stroll	successful	supper
sticky	storm	strong	such	supplied
stiff	story	strongly	sudden	supplies
still	stove	struck	suddenly	supply
sting	straight	struggle	sue	supportive

sure	swirl	tame	teddy bear	that
surface	swish	tan	tee	thatch
surly	switch	tank	teen	thaw
surprise	swum	tap	teeth	the
survive	tab	tape	telephone	theater
swallow	table	tar	telescope	theft
swam	tablecloth	tardy	television	their
swan	tablespoon	task	tell	them
sward	tack	taste	ten	themselves
sweat	tadpole	tasted	tend	then
sweater	tag	tasty	tender	there
sweatshirt	tail	tat	tenderly	thermometer
sweep	take	taught	tent	thermos
sweet	taken	tax	tenth	these
sweetly	takes	taxes	terrible	they
sweets	taking	taxi	terrific	thick
swell	tale	tea	test	thief
swift	talk	teach	than	thieves
swiftly	talking	teacher	thank	thigh
swim	talks	teacup	thanked	thimble
swimsuit	tall	team	thankful	thin
swing	taller	tear	thanks	thing
swipe	tallest	teaspoon	thanksgiving	think

third	thump	toe	torn	tram
thirsty	thunder	toenail	tornado	tramp
thirteen	thunderstorm	together	toss	transform
this	tick	told	tot	translucent
thong	tide	tomato	total	transport
thorn	tidy	tomatoes	tote	trap
those	tie	tomb	touch	trash
though	tiger	tomorrow	touchdown	travel
thought	tight	ton	tough	tray
thrash	tightly	tone	tow	trays
thread	till	too	toward	tread
three	time	took	town	treasure
threw	tin	tool	toys	treat
thrive	tiny	toolbox	trace	treatment
throat	tip	toot	track	tree
throne	tiptoe	tooth	tract	trees
through	tire	toothbrush	tractor	tremble
throw	tired	toothbrushes	trade	trial
thrown	to	toothpaste	traffic	triangle
throws	toad	toothpick	trail	tribe
thrust	toads	top	train	trick
thud	toast	torch	trains	tricks
thumb	today	tore	trait	tried

trim	tulip	typewriter	us	vine
trip	tumbleweed	ugly	use	visible
troll	tune	umbrella	usual	visibly
tromp	tunnel	unable	usually	visit
troop	turkey	unattractive	vain	visited
trot	turkeys	uncle	valentine	voice
trouble	turn	under	valley	volcano
trout	turned	underground	van	vow
truce	turtle	underneath	vane	voyage
truck	tusk	understand	vanish	wad
trucks	tweak	uneven	vase	wag
true	tweet	unhappy	vat	wagon
trump	twelve	unicycle	vegetable	wail
trunk	twice	uniform	vegetables	waist
trust	twig	unit	vein	wait
truth	twigs	unite	vent	wake
try	twin	universe	very	walk
tub	twine	until	vest	walked
tuba	twinkle	unusual	vet	walking
tube	twirl	up	videos	walks
tuck	twist	upon	view	wall
tug	twitch	upset	villain	walruses
tugboat	two	upstairs	vim	wand

wander
waxes
went
whim
wind
want
way
wept
whine
windmill
wants
we
were
whip
window
war
weak
west
whisk
windowsill
warm
weakest
wet
whisker
windshield
warmly
wealth
wetter
whiskers
windy
warmth
wealthy
wettest
whisper
wine
was
wear
whack
white
wing
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weary
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winter
waste
web
whatever
whose
wipe
wastebasket
wed
wheat
why
wire
watch
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wheel
wick
wise
watched
week
wheelchair
wickedness
wish
watches
weekend
wheels
wide
wished
water
weekly
when
widely
wishes
waterfall
weep
whenever
wife
wit
watermelon
weigh
where
wig
witch
wave
weight
whether
wild
with
waved
weird
which
wildly
without
waves
welcome
whiff
will
wives
wax
well
while
win
woke

wolves	worm	wrench	yarn	youngest
woman	worms	wrestle	yawn	youngster
won	worn	wriggle	year	your
wonder	worth	wrinkle	yeast	yourself
wonderful	worthless	wrist	yell	yourselves
wonderfully	would	write	yellow	zag
wood	wove	written	yells	zap
woods	woven	wrong	yes	zest
words	wow	wrongly	yesterday	zig
wore	wrap	wrote	yet	zip
work	wrath	yam	yoke	zone
worked	wreath	yank	you	zoo
world	wreck	yard	young	

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